The

Electrical Review

VOL. CII. JUNE 29, 1928. No. 2,640.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Technical Editor: A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE M.I.E.E., A.M.INST.C.E. *Commercial Editor:* A. H. BRIDGE.

Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address "AGEEKAY, CENT., LONDON." Code, A B C. Telephone No.: Central 5871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Contents:

	PAGE
British-Built Electric Ships	1119
The Contractors' Convention	1120
Domestic Electrification	1120
The I.M.E.A. Photograph	1120
Electrical Contractors' Conference.—I (*illus.*)	1121
Undercutting, by H. R. Taunton	1122
Arthur Nichols Moore (*illus.*)	1124
Institution of Electrical Engineers (*illus.*)	1125
Electricity Supply.—III. Finance, by D. J. Bolton (*illus.*)	1128
N.W. England Electricity Scheme	1130
Business and Industrial Notes	1131
Lighting and Power Notes	1134
Tramway and Railway Notes	1136
Telegraph and Telephone Notes	1136
Radio Notes	1137
Contract Information	1138
Forthcoming Events	1139
Notes	1140
Institution Notes	1142
Our Personal Column	1142
Financial Section—	
New Companies Registered	1143
Official Returns of Electrical Companies	1144
Financial Section—*contd.*	
City Notes	1144
Stocks and Shares	1147
South African Electrical Trade	1149
Hungarian Trade and Industry	1150
Contractors' Specifications	1150
The I.M.E.A. in the West Country.—IV (*illus.*)	1151
Domestic Electrification, by J. L. Carr and J. D. Peattie	1151
The I.M.E.A. Exhibition	1155
The Institution of Civil Engineers.—IV	1157
Domestic Lighting and Heating and their Influence on Load-Factor, by Arthur Francis Berry	1157
New Electrical Devices, Fittings, and Plant (*illus.*)	1159
Parliamentary News	1160
Legal	1160
Correspondence—	
Alternating-current in Three-core Mains	1160
Selected Station Accounts	1160
Super-pressure Cables	1161
O.L.A. Visit to All-Electric Farm	1161
Published Specifications	1161
Trade Mark Applications	1161
New Work for Contractors	1162

British-Built Electric Ships.

WITH the exception of the P. & O. line, which has under construction a large passenger liner of 19,000 tons to be driven by turbo-electric machinery, the British shipowner does not, apparently, take kindly to the idea of electrically-propelled ships. The American shipowner, on the other hand, has become firmly convinced of the superiority of this form of propulsion, and large numbers of vessels of all classes, from big passenger liners and cargo ships down to the smallest ferry and harbour tug, are equipped with the electric drive, using either the steam turbine or the Diesel engine for driving the electrical generators. In the American Navy, too, electrical propulsion is employed for the largest battleships and aircraft carriers as well as for smaller craft. It must, therefore, be regarded as a high tribute, not only to the skill of British shipbuilders, but also to that of our manufacturers of electrical machinery, that American shipowners often come to these islands when they are purchasing new tonnage which is to be electrically propelled. We learn that the United Fruit Co., of Boston, Mass., is in the market for four high-class passenger and fruit-carrying vessels for its passenger and cargo services between New York and other east-coast American ports and the West Indies. The vessels are to be steam turbo-electrically driven, and tenders have been invited from shipbuilding firms in Belfast, Birkenhead, and Glasgow, the "superintendent of new construction" of the United Fruit Co. having recently arrived in London in connection with the work.

The electric drive was first adopted by this company in 1921 on the *San Benito*, a vessel 340 ft. long, and of 3,700 tons gross, which was built by Messrs. Workman, Clark & Co., Ltd., of Belfast, the electrical machinery being supplied by the British Thomson-Houston Co., Ltd. Subsequently two further vessels of similar dimensions were ordered in this country, the only difference being that the electricity for operating the main propelling motors was obtained from Diesel-engine-driven generators instead of from steam-turbine-driven generators as on the *San Benito*. These vessels were built by Messrs. Cammell, Laird & Co.,

Ltd., of Birkenhead, the electrical machinery, as in the earlier vessel, being supplied by the British Thomson-Houston Co., Ltd. The first of these two ships, the *La Playa*, was delivered in 1923, and the second, the *La Marea*, in 1924, and in both the Diesel engines were of the Cammellaird-Fullagar opposed-piston type. It may, however, be taken as indicating the owners' opinion of the relative merits of the turbo-electric and the Diesel-electric drive for ships of this class that they have decided to revert to the former drive as installed on their first electrically-propelled ship, the *San Benito*. The new vessels will be of over 4,000 tons gross, that is somewhat larger than the three vessels referred to above, and they are also to have a somewhat higher speed than the 14 knots of the *San Benito*, so that they will be of considerably greater power. There is certain to be very keen competition for these vessels, but whoever gets them, we may congratulate ourselves that the orders will be placed in these islands and that British shipbuilders and British electrical engineers are regarded as producing work of such good quality as to warrant the placing of the contracts here rather than in America.

The Contractors' Convention.

THE last of the series of three "summer" electrical conventions or meetings of 1928 will open at Cheltenham on Wednesday next, July 4th, and continue until the following Saturday. It will be the third annual Conference of the Electrical Contractors' Association and its allied organisations, and there is good reason to believe that the proceedings will be as successful and enjoyable as were those of the gatherings at Brighton and Scarborough. In pages that follow we are devoting space to matters of general interest in connection with the meeting. No doubt some who were able to be present at the I.M.E.A. conference as well as many who have read our report of the proceedings will go to Cheltenham with certain of the subjects that arose there fresh in their minds, and discussions and unofficial conversations will be the more up-to-date and profitable in consequence. As domestic electrification work becomes increasingly important, the contractor is more directly concerned in most of the topics which exercise the minds of the industry as a whole. What greater handicap is there than reckless undercutting in whichever section it occurs? It almost inevitably means either bankruptcy for the undercutter or bad work for the consumer, with injury to the industry. Mr. H. R. Taunton, whose recent valuable articles on "Shoddy Wiring" and Registration attracted widespread attention, contributes to this issue of the ELECTRICAL REVIEW some useful notes on the undercutting evil—which unfortunately has been with us almost as long as there has been an installation branch of electrical work, whether organised or unorganised—and we put these forward now in the hope that they may assist those who take part in the Cheltenham debates. It may happen—we do not know—that they may prove timely in view of the subject chosen by Mr. H. Marryat, "Trading Without Tears: The E.C.A. Policy." Another contribution in this issue which may also be appropriate in the same connection is our extract from an American contemporary showing what is working in the minds of our transatlantic contracting cousins.

Domestic Electrification.

WHILST it must be regretfully admitted that, on the whole, the discussions at the I.M.E.A. Convention were hardly up to the normal standard, the same cannot be said of the papers, which were of a high order and contained much valuable and practical information.

Amongst the points on which stress was laid were the importance of providing electric cookers on hire or hire-purchase, and of assisting householders to defray the cost of wiring; the benefits of storage of heat during the night; the dangers attending the use of battery eliminators of unsuitable design; the remarkable increase in consumption that follows the adoption of a sound "all-in" domestic tariff; the necessity of a prompt and efficient "service" organisation, and the virtues of the two-part tariff system. All these are matters to which the ELECTRICAL REVIEW has repeatedly drawn attention, and we are glad to see them so emphatically endorsed. The figures put forward by Col. Vignoles as the result of an investigation conducted by the Electrical Development Association, showing that in 248 undertakings there were in use a year ago 55,000 cookers and nearly a quarter of a million fires, were extremely interesting; still more significant was the statement that the number of cookers had increased by no less than 57 per cent. in one year, and the fires by 32 per cent. The totals, however, bear eloquent testimony to the fact that this field as yet has hardly been scratched—the possibilities are enormous. Moreover, as Mr. E. E. Hoadley pointed out, a vast increase in the consumption of electricity in the household due to the extension of its applications has practically no effect on the maximum load experienced at the generating station, a fact which justifies the adoption of the two-part tariff. It is true that Messrs. Carr and Peattie threw out a hint with regard to the growing use of the electric radiator—that it might prove to have undesirable features; like any other domestic appliance, it may, of course, be switched on during the peak sometimes, but this has not given rise to trouble up to the present, and we do not regard it as likely to do so.

When the peak load is discussed we should bear in mind that its maximum occurs in winter; provided that no addition is made to the winter peak load, it is of little consequence whether the maximum load at other seasons is affected or not, and as the principal function of the electric fire is occasional heating, whilst coal or coke is almost invariably used throughout the winter, the risk of trouble from this source is negligible. Moreover, if the all-electric house properly so-called became the rule instead of the rare exception, as Col. Vignoles pointed out at the Engineering Conference, the electric fires would be in use for long periods and would themselves offer a good load factor in spite of their addition to the peak. Electric water heating also is not usually a winter load.

From the activity displayed by manufacturers in the improvement of electric cookers, especially in connection with the boiling plates, of which several excellent examples were shown at the exhibition at Bath, we infer that their confidence in the future of the cooker is unabated; and the attention which is now being given to the subject of heating water at night, both by manufacturers and by the managers of electricity supply undertakings, foreshadows rapid development in this department also. The prime essential is to offer an attractive tariff. Where this has been done with courage and enterprise, the result has been startling. Not only does the consumption leap upwards, but also the net profits are maintained, with every step down the ladder of price. Supply authorities who wait for the domestic demand to increase in order that they may reduce their prices have not learnt the ABC of their business. The right policy is to offer low prices—the demand will immediately respond.

The I.M.E.A. Photograph.

ACCOMPANYING this issue is an inset reproduction of the photograph of the members of the I.M.E.A. and their friends taken in the Institution Gardens, Bath, by the official photographer, Mr. Graystone Bird, of Bath. The original photograph measures 33 in. × 12 in., and is a remarkable example of professional skill; full-size copies of it can be obtained from Mr. Bird (price 7s. 6d. post free). The photograph was taken under ideal conditions, and the venerable Abbey formed an admirable background to the view.

Electrical Contractors' Conference.-I.

The Cheltenham Programme.

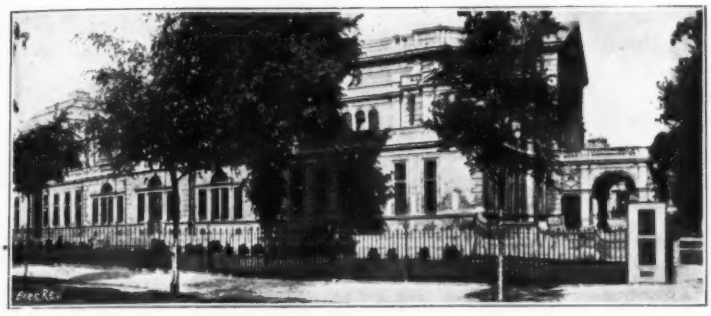


Fig. 1.—The Town Hall, Cheltenham.

ON Wednesday next the third annual conference of the Electrical Contractors' Association, Incorporated, N.E.C.T.A., Ltd., and the National Federated Electrical Association (known collectively as the E.C.A. Allied Associations) opens at Cheltenham.

The selection of this beautiful part of the country as the *venue* reflects great credit upon the wisdom of the organisers. London would probably be more accessible to the majority of members, and the main object of the Conference is strictly business. In spite of this we think that more will be attracted to the Conference than would have been the case if London had been chosen.

Some of the beauties of Cheltenham are to be seen in the pictures which accompany these notes. The Town Hall is to be the meeting place for the business sessions of the Conference, while the Winter Garden is another part of the same block of handsome buildings situated on The Promenade, a broad leafy thoroughfare which is depicted in another illustration.

Upon arrival in Cheltenham the delegates will register at the Town Hall, where they will be given their badges and all the necessary information. On Wednesday evening the President's reception will take place, followed by a conversazione and dance. Upon the two previous occasions this has proved a bright and interesting function. It is expected that the attendance will exceed last year's, which was more than 300, and so the gathering at the Town Hall will be a large one.

Business commences on the following day (Thursday) with the annual general meeting at 10 a.m. Subsequently the Mayor of Cheltenham (Alderman C. H. Margrett, C.B.E., J.P.) will extend a civic welcome to the Associations, and Mr. W. A. Shaw, A.M.I.E.E., the President, will express the members' thanks. Then the President will deliver his address, which we hope to report in our next issue. Afterwards the delegates will be asked to pose for the official photograph, and it is to be hoped that last year's experience will not be repeated, when endeavours were made to photograph the large group between heavy showers. After lunch the Conference again meets to hear Mr. W. R. Rawlings's paper on "Earthing as a Safeguard to the Public," in which the author agrees, we understand, with opinions which have been expressed time and again in our pages. Following the discussion on this paper, Mr. J. Orringe (Gent, Hurley and Orringe) will read a paper on "Electrical Development, with Special Reference to Retail Sales." This deals with a subject of burning interest to contractors—their relations with the supply authorities—and Mr. Orringe shows how the Leicester contractors and the Corporation Electricity Department have settled down to a harmonious working arrangement.

At Leicester, showrooms have been opened in one of the principal thoroughfares and stocked with appliances by the local electrical contractors. The Corporation, for a consideration, runs the showrooms, and has a department there for the payment of electricity bills. Something similar has been done at Hove, we believe, and the scheme certainly appears to provide a solution of a problem which was complicated enough to necessitate the appointment of a special committee by the Electricity Commissioners. This paper will then be discussed, and

Fig. 2.—The Promenade.

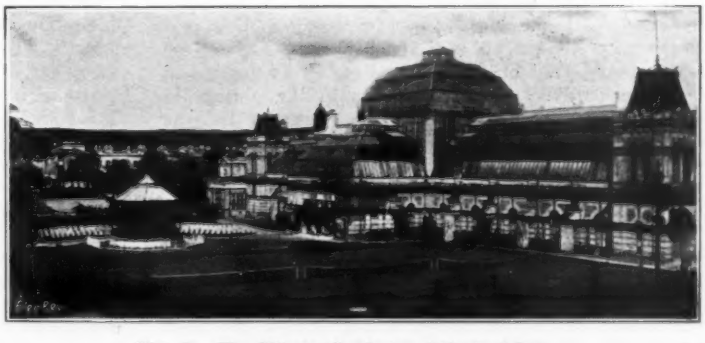


Fig. 3.—The Winter Garden and Central Spa.

we may say in passing that it is to be hoped that there will be more time allowed for the purpose than has been the case at the two earlier conventions. If the programme times are strictly adhered to and authors do not read their papers right through, there certainly should be more time for discussion. Following precedent, there will be a smoking concert at the Town Hall on Thursday evening.

Another early start is to be made on Friday, when Mr. H. Marryat will read a paper, "Trading Without Tears: The E.C.A. Policy." The author considers that at present the electrical business is a tearful one; although it is flourishing, there is no money in it. The reason appears to be the loose trading methods—or lack of them—which characterise the industry.

The business sessions of the Conference close with the usual votes of thanks, the installation of the new President, Mr. W. H. Walton (Pinching & Walton), and a short address by the latter. Friday afternoon will be devoted to a garden party and tea in the grounds of Pittville Park, in which there is a magnificent pump-room building. The waters of the spa may prove beneficial to any delegates suffering from a surfeit of business. At the invitation of the Mayor there will be a ball and supper at the Town Hall in the evening. Arrangements are being made for those who desire to stay in Cheltenham over the week-end.

Undercutting.

A constructive proposition for modifying the evil. Suggested standard Forms of Specification for different classes of installation contracts.

By H. R. TAUNTON.

OF the many enemies which beset the struggling contractor—and, interjects the pessimist, all contractors are "struggling"—one of the most insidious is undercutting. Undercutting; not competition, which is quite a different thing. Perhaps it would be as well first to make clear the distinction, lest this article be mistaken for a plea for some pale form of communism, in which we are all to do as we're told by Mr. George Bernard Shaw in return for a precisely regulated ration of broccoli and bananas.

Normal competition between contractors is not simply a question of the lowest price. It is essentially the pitting of one man's qualities and abilities against those of another; his wit, his energy, his skill and experience, his method, foresight, enterprise, integrity and every other virtue of the successful man of affairs. He who transcends in more of these than does his neighbour is he who will carry off the prize competed for: in the present instance either, in general, a prosperous business, or in particular, an individual contract. For the ability to submit the lowest tender is, in the long run, the summation of all the factors cited. Other things being equal, that man can quote the keenest price against definite requirements whose experience is widest, whose skill and ingenuity is greatest, and whose organization for securing the best results from his outlay on material and labour is the most perfect. Indeed, were it not for undercutting—and the errors of estimators—an evolutionist might almost take the figures quoted for a competitive contract as indices of the relative chances of ultimate survival of the firms competing.

Such competition, where a keen price is no more than the logical outcome of certain qualities possessed by the man submitting it, is healthy competition; for it sets a premium on those qualities, all admirable in themselves and of service, not only to the individual and his trade, but to the community at large. But the case is far otherwise when the struggle to secure orders takes the form of undercutting.

It cannot be denied that firms of repute are occasionally guilty of undercutting; though usually they can show—or manufacture—a specific reason or, at least, excuse for it. But the persistent undercutters are invariably to be found among firms of poor reputation, here to-day and gone tomorrow in a blaze of bad debts. And undercutting is their hari-kari. They vanish unregretted—except by their creditors—but even their favoured form of suicide is so clumsy that in their passing they contrive to bruise and wound the body of the trade. It is not only that they take away work from worthier firms and not seldom bring them to the verge of their own predestined ruin, but that they lower the general standard of installation work *pari passu* with the ridiculous prices they teach the public to expect, and thereby lower the whole status of the electrical contracting trade.

Undercutting is the negation of all the virtues of the fair competitor. The man who undercuts does so because he knows he cannot offer a purchaser skill and experience and good, sound workmanship. He can only tempt him by a price so much lower than his rival's as to cover his deficiencies. And having secured the order unfairly, he is automatically compelled to execute it dishonestly, if he is to snatch a profit from it. Hence shoddy wiring, and all the ills it brings the trade in its train.

Undercutting, then, may be defined as competition, not by merit, but by price only—and that price a gamble on dishonesty. To define it, however, and to call it names—an evil blight, a canker in the trade—is only to say what everybody knows. What is harder, is to suggest a remedy for it. There is none, again the pessimist puts in; the greedy and the ignorant will always be with us to perpetuate the suicidal folly of undercutting. But there are, at least, possible palliatives. Anything which strengthens the status of the trade as a whole helps it to resist the better the ills which beset it, just as a tonic helps the body to withstand disease. The E.C.A., with its associated organisations, is one such tonic; a really strong Register, if we had it, would be another. Clearly, the more difficult we make the existence of shoddy, unscrupulous firms, the less we shall be troubled with their sins.

Undercutting is a problem which most trades have had to face in one form or another, though in few of them has it taken the crudely dangerous form it has taken in the contracting trade. Many of them have been able to meet it by various forms of co-operative organisation: federations, amalgamations, trusts, rings—call them what you will. Examples are familiar to the contractor in his everyday buying. They are, however, all manufacturing concerns, producing more or less standardised articles; and it has been comparatively easy for them to agree on a scale of fixed prices. Unfortunately, it is a practical impossibility for the contracting trade to follow their example. Standardised prices are not for them. Were all contracts carried out to one identical specification, there would still be differences in the lengths of runs, architectural features, building materials, labour conditions, and a dozen other factors affecting the price per point.

The nearest approach to the possibility of fixing a standard price per point is in the case of council houses, bungalows, and similar small dwellings, needing not more than a dozen or so points. But even council houses vary, if it is only in ugliness, and most bungalows are only alike in their freakishness; so that for contractors to undertake to wire such houses for a fixed price of, say, 15s. a point in cab-tire, would be to gamble recklessly against the eccentricities of architects and builders. To increase the fixed price to, say, 20s. a point would only be to reduce the gamble slightly, and further increases would reach a prohibitive limit before they reached a safe one.

In large buildings the problem of fixing a fair average price per point is still more difficult. It is easy to say that 10s. a point for a screwed conduit job is absurdly low, or that £10 per point is absurdly high; but almost any figure in between might be reasonable under certain conditions. Indeed, it is often dangerous to quote a schedule rate per point for a single known building. A rate higher than the average of the main contract is apt to be criticised; yet on such an average rate the contractor may easily lose heavily if he is asked, as he not infrequently is, to carry out a number of extra points of abnormal length or under abnormal conditions.

If that be the case in a single building, how impossible is the problem of fixing a schedule rate for a diversity of buildings. It simply can't be done; and so price-fixing, which manufacturers have found their most potent weapon against undercutting, is definitely barred as a possibility to contractors. The most that could be done in that direction would be to agree on rates for supplying and fixing such standardised details of an installation as switches, plugs, plain pendants and the like. Schedule rates, too, are feasible for main runs per yard, for various sizes and systems. It might be worth while attempting some agreement on these minor points; at least it would all help to narrow the field in which undercutting would be possible.

If something of the sort were done it would, of course, have to be in conjunction with definite specifications. That suggests the wider possibility of circumscribing the sinister activities of the jerry wireman by the general adoption of standard specifications for wiring: complete specifications applicable to individual contracts. Something is sorely needed, more definite and precise than the usual pious allusion to the "Rules of the I.E.E."

The confirmed undercutter is not to be deterred by the most stringent specification drawn up by a competent consultant; but he flourishes most when he is quoting against the loose, vaguely worded requirements of an architect or builder, or when he is allowed to frame his own even more loose and vaguely worded "specification." Secure in the knowledge that no complaint against his work could find its basis in the ambiguous wording of his tender, he is able to pick through a score of holes in it his dishonest profit. On the other hand, let him be tied down by the terms of a clearly worded comprehensive specification, and he is faced with a definite legal risk which he would usually be chary of inviting by an unfairly cut price. That is why most reputable contractors, though they not unnaturally like to carry out a job "on their own," yet prefer, when it comes to tendering in competition, to do so to the specification of a consultant, the more rigid the better.

Such specifications, however, form a very small minority of the inquiries in the contractor's morning post. Most of them are from architects, whose sketchy specifications allow plenty of scope for "wangling"; or direct from clients, in which case there is no specification at all. The contractor is then faced with the dilemma that the higher the standard of work for which he quotes, the greater his chance of losing the order to another, undercutting him with a poorer standard.

Much of that would be obviated if there were available standard specifications for wiring, bearing, let us say, the *imprimatur* of the E.C.A. We are not referring here to the "general terms" of a contract, on which a certain degree of agreement has already been reached, but to the "working" specification, defining the system, the methods and the material to be employed in a given case. (Something of the sort has already been conceived by the electrical contractors' organisation in America and, by all accounts, successfully put into operation.) There would, of course, have to be a number of such specifications, each complete in itself, applicable to different classes of buildings, to be wired on different approved systems. For instance, there would be, say, "E.C.A. Specification 7a.—For the wiring of a factory, in cab-tire," or, " . . . 7d. . . . , in screwed welded conduit," or again, ". . . 15b.—For the wiring of a church, in lead covered"—the wording of the title, naturally, being more precise than in these abbreviated examples.

Each specification, in addition to the approved general terms, common to all of them, would define in clear detail the system of wiring to be adopted and the methods and materials to be used, from the main switch down to the furthest fitting point. Blanks would be left for the insertion of definite sizes and numbers, and perhaps for makers' names where it is usual to specify them; and alternative wording in certain cases would allow one form of specification to provide for slight modifications where necessary. Naturally, these specifications would be compiled by judicious selection from the wiring Rules of the I.E.E. to meet the variations in buildings and systems, with whatever amendments and amplifications might be deemed desirable.

Were it once known that such standard specifications were available, they would be welcomed by architects and builders and others who now have to waste good paper in compiling an unsatisfactory substitute of their own, as an alternative to employing a consultant, which they rarely do for their ordinary work. All that they would have then to do would be to tell the invited tenderer that the building was to be wired to "E.C.A. Specification Number So-and-so," for a number of points "as attached schedule" or "marked plans." Installations in larger and more important buildings, of course, would still be, as they are now, the subject of the special specifications of consulting engineers.

For his part, the contractor quoting a potential client direct, instead of spending time and type-ribbon on interminable pages of specification, laboriously compiled anew for every fresh inquiry, would simply select the appropriate E.C.A. specification form, fill in the blanks, and quote his price in a covering letter.

Presently, as the principle of these standard specifications became more widely known, the general public would begin to fight shy of contractors who did not use them for all but the most unusual cases. Most would be glad to use them: in any case, E.C.A. members would be more or less under obligation to do so, and the others would be gradually forced to do so in their own interests. To say a job had been carried out to an E.C.A. specification would in time be taken as the sole and sufficient guarantee of its quality. The prestige of the Association would thereby be enhanced; the status of the contracting trade in general would be improved; and another little nail would be knocked in the coffin which surely awaits the jerry wireman and the undercutter.

Boiler Flue-dust Collectors.

In the description of the Bristol Corporation electricity undertaking appearing in our issue of June 8th, it was stated that "Cyclone" grit catchers were to be installed in the power house. It has been pointed out that the grit catchers in question are Davidson patent flue-dust collectors of the shunt pressure type which not only differ materially in design from the dust catchers frequently termed "Cyclones," but as this name is extensively used by another firm as a distinctive title in connection with its manufactures, the reference in the article may be misleading, hence this correction.

Arthur Nichols Moore.

President of the Incorporated Municipal Electrical Association, 1928-29.

THE presidency of the Incorporated Municipal Electrical Association, which represents 90 per cent. of the local authorities engaged in electricity supply and therefore nearly two-thirds of the supply industry, is a post of high distinction and responsibility, involving a great expenditure of time and labour in the discharge of the duties attached to it. This year it has been conferred upon Mr. A. Nichols Moore, electrical and tramway engineer to the County Borough of Newport, Mon., who has long occupied a prominent place in the counsels of the Association and has devoted much time to the service of the public in other capacities.

A native of Cheltenham, Mr. Nichols Moore was trained in civil and electrical engineering at the Sheffield School of Technology, and served as premium pupil with the Brush Electrical Engineering Co., Ltd. He was also for some time in the office of Mr. W. J. Walker, consulting engineer, Westminster, and for one year with the Blackpool and Fleetwood Tramroad Co.

Entering municipal service in 1902 as charge engineer with the Manchester Corporation, in 1905 he became assistant resident engineer at Stuart Street Station, being chiefly responsible for constructional work, and in recognition of his special services as acting resident engineer he was awarded an honorarium.

Elliott & Fry] [*London.*

Mr. A. Nichols Moore, M.I.E.E.,
President of the I.M.E.A., 1928-29.

In 1906 Mr. Nichols Moore was appointed resident engineer to the Belfast Corporation electricity works, and supervised the construction of the new tramway power station, becoming deputy city electrical engineer in the following year, a position which he retained until in 1912 he was unanimously offered the post which he now occupies by the Newport Borough Council. In that capacity he completely re-organised the electricity department and prepared a large scheme of extensions which was unanimously adopted by the Council; since then he has carried out several further extensions to cope with the remarkable development in the demand for electricity in Newport, which is essentially an industrial area. Large additions are now being made to the power-station plant, which has a present capacity of 25,000 kW; another 10,000-kW set is being installed, with two boilers each having an output of 65,000 lb. per hour.

Four years ago, in collaboration with Mr. W. M. Selvey, he carried out important experiments in connection with the possible use of the water of the River Usk as condenser circulating water; their joint report was adopted by the Council and approved by the Electricity Commissioners, and Mr. Nichols Moore prepared a scheme for the construction of a pumping station and discharge works further down the river. This work, which involved exceptional civil engineering and electrical engineering difficulties, is now being carried out. The plant will have an ultimate capacity of four million gallons per hour.

He is a member of the Institution of Electrical Engineers, and was first elected to the Council of the I.M.E.A. in 1921. As is well known, he has, in conjunction with Mr. Purse, always been a strong advocate of greater representation of the smaller undertakings on the Council, and it was due to their efforts that the Articles of the Association were altered to enable this to be done. He has always taken a very keen interest in the Association's work, and has for some years been chairman of the municipal section of the I.M.E.A. - B.E.A.M.A. Joint Committee, in whose work, as is particularly well known, he has been specially interested. He also represents the Association on B.E.S.A. Sub-Committee 22/7 (Prime Movers) and Panel 22/7/1 (Steam Turbines).

Mr. Nichols Moore's activities have by no means been confined to his official duties under the Corporation. He has acted as consulting engineer to the Monmouthshire County Council and also to the Llantarnam Urban District Council in connection with its recent successful application for a Special Order.

He was one of the original members of the committee appointed by the Electricity Commissioners to consider and report upon a scheme for the development of electricity supply in the South Wales and Monmouthshire area under the Electricity (Supply) Act, 1919. Later, when the Advisory Committee was established, he became a co-opted member.

Mr. Nichols Moore was for some years one of the Technical Advisers of the Electricity Supply Industry in the South Wales and Monmouthshire area in connection with the Ministry of Labour Training Scheme; he is a member of the Electric Fittings Statutory Committee, and has been an occasional contributor to the technical Press. He has for nine years been honorary secretary (provincial) of the Associated Municipal Electrical Engineers (Great Britain and Ireland), which position he has now resigned owing to pressure of work; he is also a past president of that Association.

During the war, although on two occasions he offered himself under the Derby Scheme, he was not accepted

in view of the importance of the work upon which he was engaged under the Ministry of Munitions in connection with the carrying-out of large extension schemes for the supply of electricity for war purposes. He also acted as consulting engineer to the Newport Shell Factory and the Uskside National Works. He was a technical adviser on the Board of Trade Tramways Committee (South Wales and Monmouthshire area), and was appointed by the Coal Controller as district engineer to advise on industrial coal economy.

The success which Mr. Nichols Moore has achieved in the development of his undertaking during the past 16 years, without external assistance (except, at his own request, in connection with the River Usk investigations), and in the various other capacities in which he has acted, leaves no room for doubt that as president of the Association he will maintain the high standard of efficiency and devotion to duty that has been set by his predecessors, and we offer him congratulations and our best wishes for a happy year of office.

Institution of Electrical Engineers.

An account of the Summer Meeting at Glasgow and Edinburgh, and in the West Highlands.

WITH happy recollections of the 1922 tour,[1] when they were privileged——

". . . to bear
The best of her in memory away" . . .

those members of the Institution of Electrical Engineers who participated again this year in the summer meeting (June 25th to 30th) at the Scottish Centre were this week able once more——

". . . for a brief spell to share
old Glasgow's smiles . . ."

Glaswegians are proud of their industrial capital, and during the very week of our visit were celebrating a great historical pageant at Carscube, re-enacting scenes of the town's foundation and its rise to the position of a leading city of the Empire: but it was the noble university which crowns the summit of Kelvingrove that attracted attention, representative to the world of science of the throne of Sir William Thomson, who chose for his title the name of the stream that flows through the tree-clad grove below and the sound of whose waterfalls can be heard beside the statue of Lord Kelvin in his chair.[2]

Lord Kelvin was first chairman of the I.E.E. Scottish Centre, and the visiting president has also occupied that chair, in which Mr. D. Macfarlane Macleod sits this year, Mr. D. Smeaton Munro being chairman-elect for next session. Founded in 1900, the Centre's total membership is now about 700; in addition to meeting in Glasgow and Edinburgh, a special meeting is held at the active Dundee Sub-Centre (chairman: Mr. R. K. Robertson) in April annually, and the Scottish Students' Section continues to flourish.

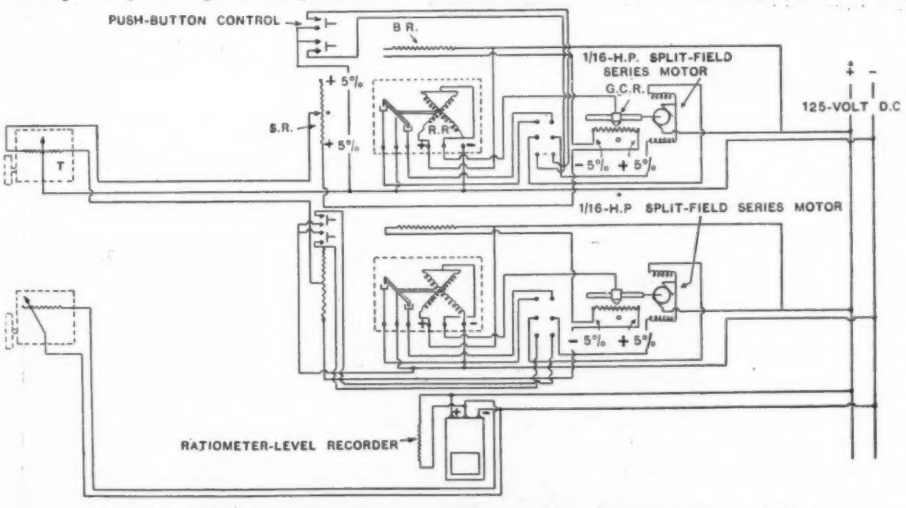


Fig. 1.—Diagram of Connections of Water-control Apparatus, Falls of Clyde.

Glasgow University.

On Tuesday (June 26th) the tour commenced with a drive by motor coach to the University, when the Lord Provost, Sir David Mason, and the principal, Sir Donald MacAlister, held a reception in the Engineering Department.

The University, with which such names as Watt, Rankine, the brothers James and William Thomson, Barr and Gray are prominently associated, was founded in 1451 by a bull of Pope Nicholas V. Within its precincts on Gilmorehill are the official residences of the principal and 12 of the professors, No. 11 being of special interest, as it was the home of Lord Kelvin, who was elected to the Chair of Natural Philosophy in 1846 and occupied it for 53 years, and is said by him to have been "the first house on this planet to be electrically lit throughout." Although an electrical engineering lectureship was instituted in 1898, it was not till 1921 that the Chair was founded, to which Prof. G. W. O. Howe was appointed

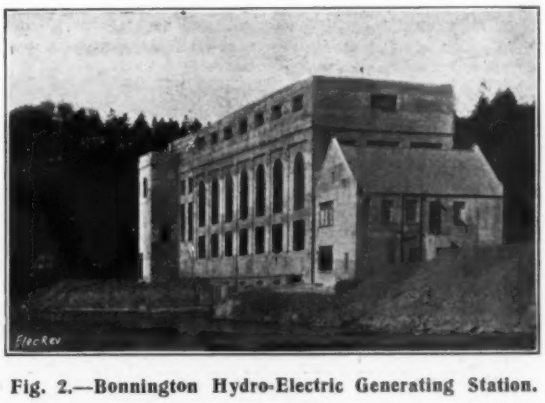


Fig. 2.—Bonnington Hydro-Electric Generating Station.

[1] ELEC. REV., June 2nd, 1922, *et seq.*

[2] The preparation of these notes was facilitated by an official souvenir handbook, an illustrated descriptive guide to the places visited during the tour, the compilation of which must have demanded much of Mr. D. S. Munro's time.

The Clyde Valley Electrical Power Co.

Following the reception, the party was taken from the city in motor coaches to Lanark to view the two hydro-electric stations of the Clyde Valley Electrical Power Co., luncheon and tea being provided by the Company. Under the chairmanship of Sir Frederick Gardiner, it serves some 20,000 consumers in an area of 1,033 sq. miles, its annual output being 220 million kWh, for which an average price of 0.7828d. per kWh is obtained, the load factor being 41.74 per cent.

Fig. 3.—Stonebyres Water-power Station.

The Company (general manager: Mr. E. T. Goslin; chief engineer: Mr. D. Macfarlane Macleod) has an installed plant capacity of 120,000 kW, of which 15,520 kW is hydraulic, and the maximum load recorded on the system reached 67,400 kW; 25-cycle, 3-phase a.c. is generated and transmitted at 11,000 volts, some 304 miles of e.h.p. underground and 90 miles of overhead transmission lines being in use, and the energy is distributed from 300 sub-stations. Of the five generating stations: Yoker (steam, 1905), Motherwell (steam, 1906), Clyde's Mill (steam, 1916), Bonnington and Stonebyres (hydraulic, 1927) all, except the Yoker plant, have been selected for interconnection to the national "grid" system. In order to cater for the growing demand for electricity in rural districts the Strathclyde Electricity Supply Co., Ltd., was formed, and other associated undertakings are Clyde Valley Accessories, Ltd., the Kilmalcom Electric Lighting Co., and the Lanarkshire Hydro-Electric Co., the last named being responsible for the water-power installation.

Fig. 5.—Stonebyres Surge Tank, showing Spillway.

The Falls of Clyde Plant.

Situated in fruit-growing Upper Clydesdale, this plant[3] is notable in several respects: first, because it is the largest of its kind to be utilised for providing a public supply of electricity in this country and, secondly, because it employs the unregulated water of the River Clyde. Storage would have been costly, and in this case is relatively unimportant, as the two stations are interconnected by the two overhead lines and tied by three lines to the Company's steam network. The counterweight-balanced tilting weirs, operated by hydrostatic pressure, employed to impound water and maintain the river level variation within 6 in., have already been described[3]; another important feature is the float regulator, the function of which is to control the quantity of water passing through the turbines at any given instant to suit the river-flow conditions then obtaining. The apparatus was supplied by Geo. Kent, Ltd., to the specification of the English Electric Co., Ltd., which was responsible for the hydro-electric plant, the civil engineering work having been executed by Sir Wm. Arrol & Co., Ltd.

The regulator consists of a transmitter T (fig. 1) in the form of a variable resistance actuated by a float on the water at the intake: an underground cable connects the transmitter in

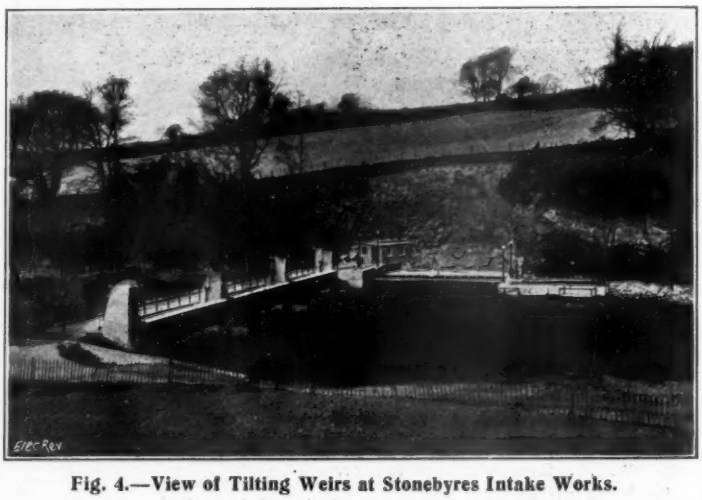


Fig. 4.—View of Tilting Weirs at Stonebyres Intake Works.

series with a synchronising resistance SR at the generating station, which is an ordinary 100-way switchboard rheostat, and under normal operating conditions remains in the mid position. Connected to it are a governor-control resistance GCR, mounted directly on the turbine governor, and a balancing resistance BR, all four being in series across the 125-volt station battery. The contact arm fixed to the governor speed index divides the total resistance into two parts, across which a ratiometer relay RR is connected, the complete circuit thus forming a Wheatstone bridge network. The values of the various resistances are so proportioned that when the water level is midway between the operating limits and the synchronising rheostat is in its normal running position, the relay will cause the speeder motor to set the speed index to the mid position, under which conditions the network will be balanced. The speed regulator (fig. 7) on the turbine governor gives a variation of plus or minus 5 per cent. of the synchronous speed: the effect of the river rising is to alter the setting of the transmitter T resistance,

[3] See also ELEC. REV., June 25th, 1926.

which, in turn, disturbs the balance of the Wheatstone bridge circuit and causes the relay to start the turbine speeder motor, thus tending to increase the speed; but, as the speed of the alternator is determined by the frequency of the electrical system, the load on the machine is increased instead. The converse applies, of course, in the case of the river falling. The synchronising rheostat acts as a hand-operated transmitter for use only to adjust the speed of the turbine for synchronising purposes, it being thereafter returned to the normal position so that the load on the generator is automatically adjusted in accordance with the amount of water available. The double-pole double-throw switches shown in fig. 1 are for changing over from automatic to push-button control.

One of the stations (figs. 2 and 6) utilises the combined energy of the Bonnington and Corra Linn Falls (189 ft. head), having a net catchment area of 331 sq. miles; the other (figs. 3, 4, 5 and 7) uses the Stonebyres Falls (97.5 ft. head), having a net catchment area of 385 sq. miles. The average annual rainfall is 43 in. The former plant consists of two 4,920-kW generators, and the latter of two 2,840-kW sets, the turbines being of the vertical-shaft inward flow reaction type, 375 r.p.m., each coupled direct to a 25-cycle, 3-phase, 11,000-volt alternator. The switchgear has a rupturing capacity of 25,000 kVA, the whole of it being operated from a control platform in the turbine house. The output of both stations is transmitted by three 3-phase double-circuit lines, provided with balanced protective gear, one being a trunk feeder to the bus-bars at the Company's steam-driven Motherwell station and the other two lines feeder distributors; the voltage drop is compensated for by booster transformers controlled by Brookhirst regulating gear.

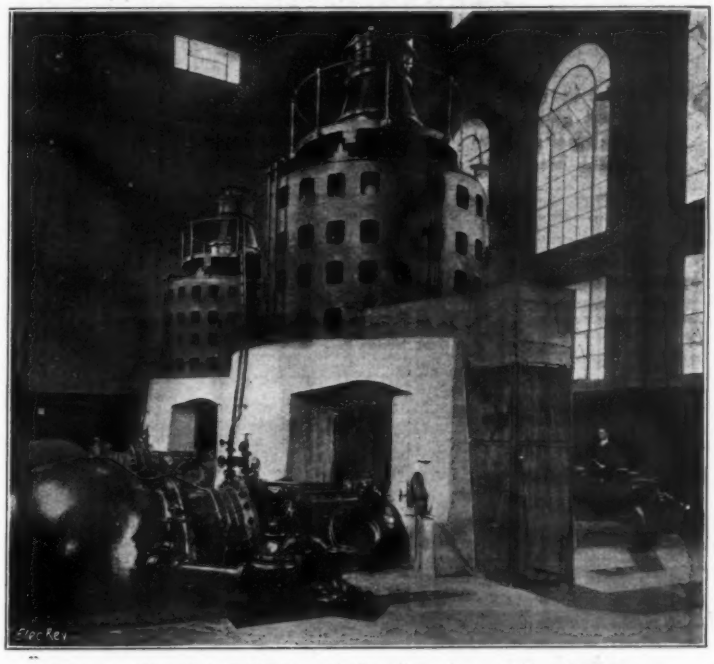


Fig. 6.—The Two 7,000-h.p. Turbo-alternators at Bonnington.

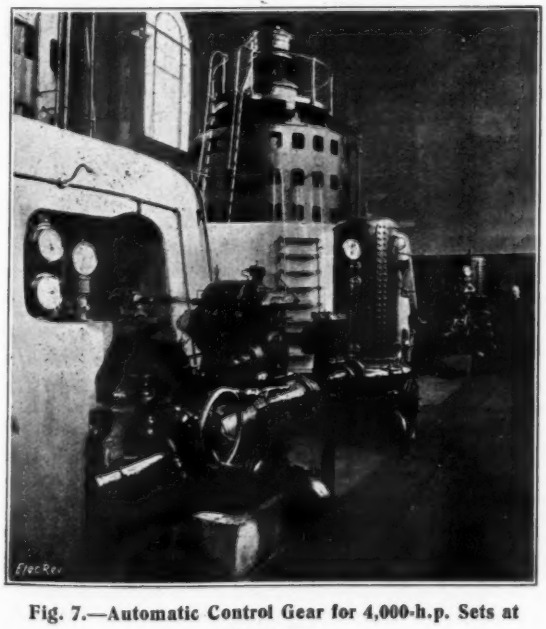


Fig. 7.—Automatic Control Gear for 4,000-h.p. Sets at Stonebyres.

Messrs. Buchan & Partners, of Edinburgh, acted as consultants for the scheme, the capital cost of which was £27 per kW of plant installed.

The I.E.E. Dance.

After tea at the water-power plant, the party returned by motor-coach to Glasgow. During the evening a conversazione was held at the Central Station Hotel: Mr. A. Page (president of the I.E.E.), with Mrs. Page, and Mr. D. Macfarlane Macleod (chairman of the Scottish Centre), with Mrs. Macleod, received the guests and members, and dancing was indulged in to a late hour.

(To be continued.)

American Illumination Congress.

At the first World Congress on Illumination to be held at Saranac Inn, N.Y., from September 22nd to 28th, lighting problems are to be investigated from a world-wide standpoint. The Congress will be a gathering from many countries of the members affiliated with the International Commission on Illumination, and foreign delegates will meet in New York about September 5th. Mr. Thomas A. Edison is honorary chairman and Mr. John W. Lieb is the active head of the committee which will welcome the visitors from abroad and look after their needs throughout their stay. All arrangements in connection with the Congress are being made from the headquarters of the Illuminating Engineering Society, 29, West 39th Street, New York. An inspection tour will be made of outstanding lighting installations and the important laboratories and manufacturing establishments devoted to illumination in the metropolitan area. The visitors will then make a trip by special train to Philadelphia, Washington, Boston, Cleveland, Detroit, Chicago, Niagara Falls, and Toronto (Canada), where the tour of inspection will end about September 17th, the opening date of the 22nd Annual Convention of the Illuminating Engineering Society. Immediately following the Toronto convention the meetings of the International Commission on Illumination will open at Saranac Inn, N.Y., and sessions are scheduled to be held under the auspices of various International Technical Committees, including "Daylight Illumination," by the British Committee.

Electricity Supply.—III. Finance.

In this article the financial results disclosed by the recently published figures of the Electricity Commissioners are illustrated and discussed.

By D. J. BOLTON, Author of "Electrical Engineering Economics."

PREVIOUS articles under this heading have dealt with the generation and sales aspects of public electricity supply in this country. In the present and concluding article it is proposed to examine the financial results as exhibited in the Commissioners' Returns. The year to which most of the illustrations refer is the last of the five years covered by the published data, namely, that terminating at December 31st, 1925, in the case of the companies, and March 31st or May 15th, 1926, in the case of the local authorities, and this is here referred to simply as the year 1925. When contrast is needed with some previous period, the year 1922 will be selected as the basis of comparison, for the following reasons:—When the figures first began to be issued, the results obtained were naturally not so full and complete as became possible later, and consequently the data for the first year presented (1920) are by no means complete. Moreover, the second year, 1921, coincided with the worst severity of the post-war slump and was therefore in many respects not representative. By taking the year 1922, a full and typical set of figures is obtained which is still far enough back to afford a useful standard of comparison with the latest returns. The results will be considered below under the four headings of capital, revenue, expenses and surplus.

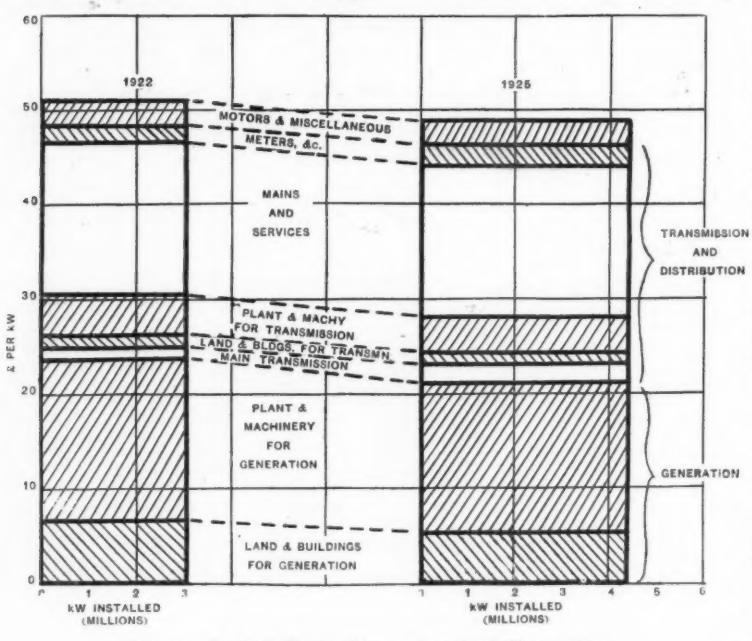


Fig. 1.—Capital Expenditure at end of Year Shown.

In a business of a given size and employing a fixed amount of capital, if it could be shown (as can be done with electricty supply) that in three years the output had gone up nearly 50 per cent., the mean price of the product had gone down by 20 per cent., and at the same time the surplus of income over expenses had still been materially increased, such results would appear to be satisfactory to shareholders and consumers alike. But in the case of electricity supply the results must be qualified by a consideration of capital expenditure, since the size of the business and the plant employed, are *not* fixed, but in fact have grown very considerably during these years. Before going into questions of revenue and expenses, it will therefore be well to consider this question of capital expenditure.

In the three years 1922-1925 there was a steady and continuous laying down of new plant, in fact the total capital expenditure increased by 37 per cent. in this period. The important things to find out are—what forms has this expenditure taken, and how does the cost compare with the increased capacity, the increased output, and the surplus of receipts over expenses? Much of the plant installed, such as mains, cannot be rated directly in kilowatts, but a useful basis of comparison is the kW capacity of the generating plant. Dividing the capital expended by the kW of generating capacity gives a total of £49 per kW at the end of 1925, which is slightly less than the corresponding figure for 1922. In order to compare the two years on level terms, rectangular diagrams have been employed (fig. 1), the ordinates being in £ per kW

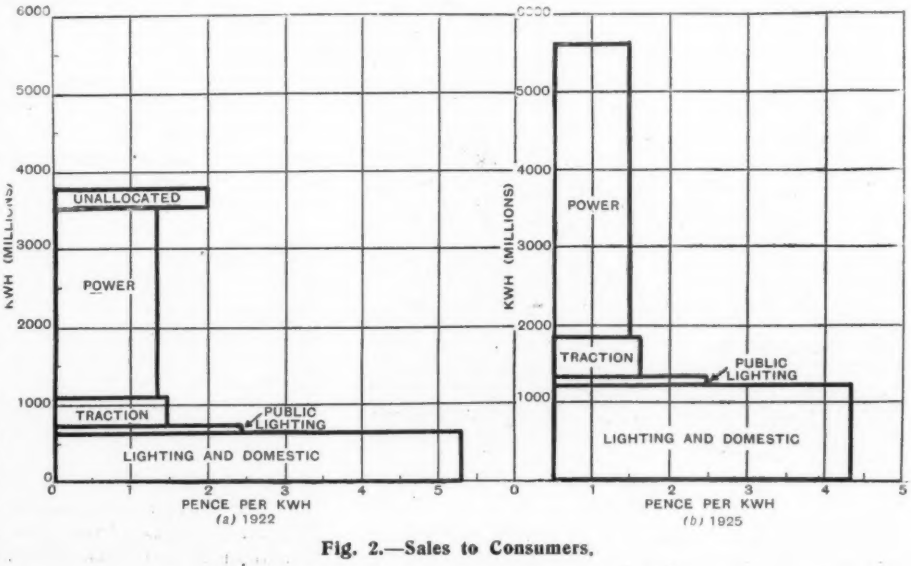


Fig. 2.—Sales to Consumers.

and the base in kW. The areas therefore represent capital expenditure, and the two columns are divided up into rectangles to show the directions which this capital expenditure has taken. It will be noted that as regards

Fig.3.—Disposition of Receipts.

the transmission and distribution items, it is only the areas of the rectangles which are known, not their shapes, but for convenience they are all drawn to the same base, namely, kW of generating plant.

The conclusions which can be drawn from this diagram are sufficiently obvious to need little comment. The capital expenditure on transmission and distribution is slightly greater than that on generation, particularly in the later year shown. In fact the expenditure per kW on generation has shown a definite decrease in the three year period, whereas than on transmission and distribution has shown a slight increase. This increase, it will be seen, is chiefly in the expenditure on main transmission lines. The expenditure on low-pressure mains and services was identical for the two years shown, namely, £16 4s. 0d. per kW of generating plant.

The next questions to be considered are those concerning the sources of income and expenditure. As regards the former, 90 per cent. of the total revenue comes from the sale of energy to the actual consumers, 4½ per cent. from the sale of bulk supplies, and the remaining fraction comes from rental of electrical apparatus, work done for consumers, profit on the sale of fittings, and so on. Electricity supply in fact appears to offer a unique example of the almost complete absence of "middlemen," and this is, no doubt, why the producers of electricity, *i.e.*, the station engineers, have at all times taken so close an interest in the consumers and methods of consumption.

The two chief groups of consumers are the power group and the lighting and domestic group. The former took 67 per cent. of the total energy sold to consumers, and contributed 40 per cent. of the revenue therefrom. The latter took only 22 per cent of the energy, but contributed 51 per cent. of the revenue. In addition there was an appreciable sale of energy for traction purposes (in quantity, nearly half the domestic consumption), and a small quantity for public lighting. In fig. 2b, the revenue from these sources is illustrated by means of a number of rectangles. The total units sold are plotted vertically and the mean price per unit for each group forms the base of the corresponding rectangle. Hence, the area of each rectangle gives a measure of the revenue obtained from that particular group. On the left of the same diagram, fig. 2a, are shown the corresponding results for the year 1922. It will be seen that the progress made in the three years is a very satisfactory one. Each rectangle has grown taller and narrower, showing that more units have been sold at a smaller price per unit. Moreover, the total revenues (represented by the areas) have increased in every case.

The next step is to see where this money goes to. If a summary is made of the results just illustrated it will be found that in all 5,600 million units were sold to consumers in 1925 at an average price of 1.65d. per unit, bringing in a total revenue of £38½ million. To this must be added a small amount, about £½ million, which represents the money received in rentals, maintenance of public lamps and work done for consumers, minus the cost of this maintenance and work done. This total is represented by the total area of the circle in fig. 3, and is divided up radially to show how the money thus received is expended. It will be noted that slightly more than half goes in working expenses, and rather less than half in capital charges and disbursements. The former is split up as shown into fuel, wages and other expenses for generation, distribution expenses, management, rents, rates and taxes. The capital expenses are split up into interest and depreciation, but it should be noted that the dividing line here is not very informative, since the diagram represents the combined effect of two sorts of organisation, namely, municipalities and companies, which differ greatly in this respect (the next illustration will make

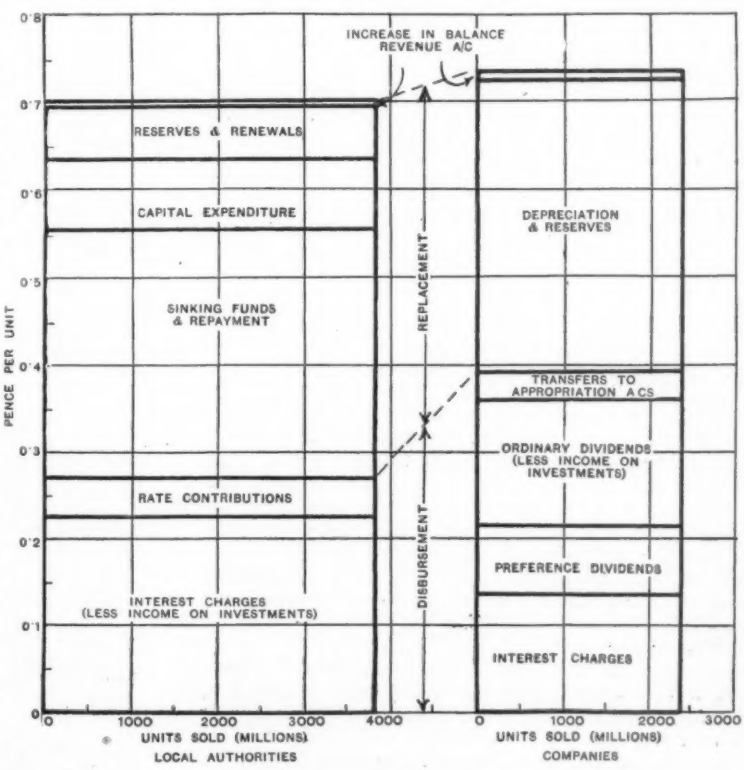


Fig. 4.—Appropriation of Surplus.

this clear). Both the costs of energy purchased in bulk and receipts from the sale of bulk supplies have been omitted from the above illustration, fig. 3, since to include these would entail some duplication. The diagram

therefore, like the previous one, refers to the receipts and expenses from the sale of energy *to consumers*.

Comparing again the results with those of the period three years back, the receipts in 1922 (represented by the areas depicted in fig. 2a) were 85 per cent. of those in 1925. This could be represented by a circle having 8 per cent. smaller radius than that shown in fig. 3. But as the proportions spent in different directions have altered in the period, it is less confusing to employ the same sectors and vary the radius of each. The areas of the sectors up to the dotted arcs, therefore, represent the corresponding totals for 1922. It will be noticed that the item which has shown the biggest increase in the three years concerned is that of rents, rates and taxes (nearly 50 per cent.). Most of the other

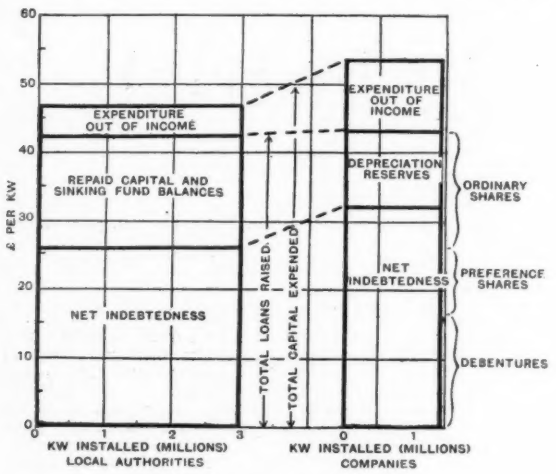


Fig. 5.—Loans and Debts.

overhead expenses have also gone up very considerably, with the exception of the sums apportioned to depreciation. The increase in expenditure on fuel shows only a moderate increase, whilst the other generation expenses have hardly increased at all, and, of course, in proportion to the output or kW capacity, they have very considerably decreased. Referring to the last mentioned item, in the latest return the figures are divided up as between wages, repairs, maintenance, and so on, and this is partly indicated by a shorter radius line.

The next diagram, fig. 4, shows the appropriation of the surplus which remains when working expenses are subtracted from revenue (*i.e.*, that represented by the left hand side of the circle in fig. 3). For this purpose it is necessary to deal separately with local authorities and companies, and as the former are of approximately twice the magnitude of the latter, it is advisable to plot the figures *per unit*. By using rectangular diagrams in which the bases refer to units sold, the areas will give actual £s. appropriated, whilst the heights will then be comparable. The mean prices charged per unit are almost identical in the two cases (taking prices to consumers, the figures are 1.64d. per kWh for local authorities, and 1.66d. for companies), so that the revenues per unit are practically the same for the two. The working expenses per unit are slightly greater in the former case, so that the surplus resulting from the difference is slightly less, as is shown by the smaller height of the left hand figure.

The way in which the surplus is allocated is clearly shown by the horizontal dividing lines. Splitting up the total roughly into two groups, namely, money disbursed (interest and dividends), and money laid by (depreciation and amortization), there is a very noticeable difference between the two types of management. The net result of this difference, in so far as it affects capital indebtedness, can be seen in the final diagram, fig. 5. This is scaled in the same way as fig. 1, *i.e.*, installed capacity of generating plant along the base and £s. per kW vertically, so that the areas represent actual capital expenditure. The company undertakings are represented by the right hand column, and it will be seen that their expenditure per kW has been slightly greater than that of the local authorities. A certain amount of this total expenditure was from revenue, and is represented by the top rectangle in each column. The remainder, totalling approximately £43 per kW in each case, was from loans, and in the case of the companies this was made up of debentures, preference and ordinary shares, as shown by the brackets on the right. But whilst the total loans raised per kW are almost identical in the two cases, it will be seen that the municipalities, owing to their different policy and statutory obligations, have repaid or accumulated balances totalling 39 per cent. of their loans, whereas the depreciation reserve funds in the case of the companies total only 25½ per cent.

N.W. England Electricity Scheme.

Outline of a Scheme Prepared by the Electricity Commission and transmitted to the Central Electricity Board.

THE North-West England and North Wales Electricity Scheme, 1928, prepared by the Electricity Commission in pursuance of Sec. 4 of the Electricity (Supply) Act, 1926, was published by the Central Electricity Board last week. It is the fourth scheme of its kind, and applies to a large area of about 9,082 sq. miles stretching down the N.W. coast of England and Wales, including the counties of Lancaster, Cumberland, Westmorland, Anglesey, Carnarvon, Denbigh, Flintshire, Merioneth and Montgomery; and parts of the counties of Chester, Cardigan, Derby and Shropshire. It stretches from the Scottish border to the County of Radnor, and from St. George's Channel to the boundaries of Northumberland, Durham and Yorkshire, and had a population at the last census of 6,980,925. The area embraces densely populated industrial centres, dealing with textiles, coalmining, stone and slate quarrying, engineering, shipbuilding and the chemical trades; it also covers wide tracts of agricultural territory and extensive moorlands.

At present there are 122 authorised undertakers in the area, owning between them 70 public generating stations. The consumption of electricity in 1926-27 was about 185 kWh per head of the above-mentioned population, which figure, it is estimated, will increase to an average of 429 kWh in 1934-35.

It is proposed that 27 existing stations and two new stations shall be selected and operated for the Board; it is also contemplated that six further coal-fired stations will come into the scheme under temporary arrangements for a few years, and that arrangements will be made with the North Wales Power Co. for the use of its two hydro-electric stations. In addition, certain sources of waste heat may, on the completion of the scheme, be utilised for the advantage of the area. Broadly, ten of the selected stations will carry the base load, while the remainder will be used for the peak load. It is thought that in due course it will be possible to reduce the number of peak-load stations required.

Table I.—Existing Selected Stations.

Accrington (Accrington Corporation).
Agecroft (Salford Corporation).
Ashton-under-Lyne (Ashton-under-Lyne Corporation).
Atherton (South Lancashire Tramways Company).
Barton; Stuart Street (Manchester Corporation).
Bolton (Bolton Corporation).
Bury (Bury Corporation).
Chadderton (Oldham Corporation).
Hartshead (Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board).
Kearsley; Padiham; Radcliffe (Lancashire Electric Power Company).
Lancaster (Lancaster Corporation).
Lister Drive (Liverpool Corporation).
Nelson (Nelson Corporation).
Percival Lane (Mersey Power Company, Limited).
Rawtenstall (Rawtenstall Corporation).
Ribble (Preston Corporation).
St. Helens (St. Helens Corporation).
Southport (Southport Corporation).
Stockport (Stockport Corporation).
Trafford (Stretford Urban District Council).
Wallasey (Wallasey Corporation).
Warrington (Warrington Corporation).
Wigan (Wigan Corporation).
Willowholme (Carlisle Corporation).

Existing generating stations that have been selected are named in Table I, and three-phase, 50-cycle generating plant and boilers are to be added to the undermentioned stations:—

(i) Agecroft, 50,000 kW, for the winter of 1935-36.

(ii) Barton, 40,000 kW, for the winter of 1930-31.

(iii) Chadderton, 50,000 kW, for the winter of 1938-39.

(iv) Hartshead, 50,000 kW, for the winter of 1937-38.

(v) Kearsley, 50,000 kW, for operation by the winter of 1936-37, and another 50,000 kW by 1938-39.

(vi) Padiham, 50,000 kW, for the winter of 1940-41.

(vii) Percival Lane, 50,000 kW, for operation by the winter of 1934-35, and a further 50,000 kW for the winter of 1939-40.

(viii) Ribble, 50,000 kW, for operation by the winter of 1934-35, and also 50,000 kW prior to the winter of 1938-39.

(ix) Willowholme, 15,000 kW, for operation by the winter of 1931-32, and also 25,000 kW prior to the winter of 1937-38.

The two new three-phase, 50-cycle capital stations which are to be built and selected are to be located at:—

(i) Carrington (Manchester Corporation), the first section of which shall comprise 50,000 kW for operation by the winter of 1934-35; an addition of 50,000 kW for operation by the winter of 1936-37; and a further addition of 50,000 kW for operation by the winter of 1939-40.

(ii) Clarence Dock (Liverpool Corporation), the first section of which will comprise 50,000 kW for operation by the winter of 1930-31; an addition of 200,000 kW for operation in sections by the winters of 1933-34, 1935-36, 1937-38, and 1939-40, respectively; and 100,000 kW more for operation by the winter of 1940-41.

While the scheme is being carried to completion arrangements will be made for the temporary operation of plant in 25 municipal stations, in 5 company stations, in 3 tramway stations, and in two hydro-electric stations of the North Wales Power Co., Ltd.

(To be concluded.)

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

Electrical Review Index.

The index to Vol. CII. (for the half-year ending June 30th, 1928) will be published shortly, and we shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.4.

Social Events.

On June 16th the employés of Messrs. J. H. Tucker & Co., Ltd., spent a very enjoyable time at Blackpool on the occasion of the annual works outing. A hearty reception was given to Mr. J. B. Tucker, who presided at the dinner. Mr. Tucker regretted the absence of Mr. Martin, who had been prevented from coming by the I.M.E.A. Convention, and that of Mr. Davies, who was indisposed.

The Social Association of Messrs. Elliott Bros. (London), Ltd., held its annual sports and garden fête on June 16th, at Beckenham Hill. Among those present were Sir G. K. B. Elphinstone and Lady Elphinstone, Mr. and Mrs. L. W. Smith, Mr. and Mrs. R. O. Smith, and Mr. and Mrs. A. W. Atkyns. The entries for the sports surpassed those of previous years and there were many amusiag and exciting events. The children were specially catered for and there were numerous sideshows. Music was provided by the Lewisham Borough Silver Band during the afternoon and by the "Lyric" Orchestra in the evening for dancing. The prizes were presented by Mrs. L. W. Smith.

Employment During May.

The June *Ministry of Labour Gazette* reports that employment in the engineering industry during May was still quiet and showed little change, on the whole, as compared with the preceding month. It was fairly good in the electrical and locomotive branches and fair in the motor vehicle section. The percentage of unemployed remained stationary at 8.6. There was a slight increase in electrical engineering unemployment, from 4.7 to 4.9 per cent. There was also a rise in unemployment in the electrical wiring and contracting industry—from 7.5 to 8.1 per cent. On the other hand, the proportion of unemployed in the electric cable wire and lamp manufacturing group fell from 6.2 to 5.7 per cent. The actual numbers of unemployed in the sections mentioned were as follows: Engineering, 83,566; electrical engineering, 3,788; electrical wiring and contracting, 1,161; and electric cable, wire and lamp manufacture, 4,798.

Unemployment.

The Ministry of Labour returns for the week ended June 11th gave the number of unemployed as 1,149,000. This represented a decrease of 10,150 during the week, but the total was still 121,170 above that of June 13th, 1927.

Book Notices.

"Electric Heating," by E. A. Wilcox. Pp. viii+469; figs. 152. London: McGraw-Hill Publishing Co., Ltd. Price 25s.

"Alternating Current Power Measurement," by G. F. Tagg. Pp. viii+66; figs. 50. London: Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d. net.

"The Henley Telegraph," June, 1928. London: W. T. Henley's Telegraph Works Co., Ltd. Price 6d. net.—This issue of the "Telegraph" is, like its predecessors, full of witty and interesting matter.

Poland's Electrical Requirements.

The Warsaw correspondent of the Berlin *Industrie und Handels-Zeitung* points out that electrical manufacture in Poland has advanced considerably during the past three years, owing to the increase in the home demand. In 1925 the output amounted to 7,700 tons, and the consumption to 23,400 tons; in 1926 it was 8,600 tons, against a home consumption of 21,000 tons; whilst last year the output of the factories totalled nearly 12,000 tons, compared with 31,000 tons consumed. The number of workpeople rose during these three years from 3,900 to 6,700. The output of the local factories included installation material, and machinery and apparatus of medium capacity, while the following classes of material continued to be imported in increasing quantities: condensers, internal combustion engines, motors for mining, lifting magnets, electric furnaces, locomotives, meters, automatic telephones, and certain kinds of lamps. Imports rose in value from 67 million zloty in 1925 to 95 million zloty in 1927 (from about £2,500,000 to £4,000,000).

The French Electrical Industry.

Before the war the amount of capital invested in France in the electrical manufacturing industry was 307 million francs. The total is now estimated at 2,300 millions, but it should be noted that in the meantime the value of money has declined substantially. It may be calculated that the capital invested in this industry is now one and a half times as great as it was in 1913. The number of workpeople so engaged has risen from 25,000 to 70,000. Taking into consideration the introduction of the eight-hour day, it may be reckoned that there has been an increase in the labour force of about 125 per cent. Great extensions have taken place in the construction of electrical machinery and also the manufacture of lamps, cable, and, more recently, radio apparatus. Exports of electrical goods rose from about 10,000 tons in 1913 to 26,000 tons in 1926, whereas imports, particularly from Germany, declined. The French manufacturing industry is likely to experience considerable benefits through the recent arrangement for inter-working between two important undertakings, namely, the Thomson-Houston Company and the Société Alsacienne des Constructions Mécaniques, to which we have already referred.

Proposed Norwegian Tariff Amendments.

The *Board of Trade Journal* reports that the Norwegian Ministry of Finance has put forward a number of alterations in the Customs tariff for the Budget period 1928-29. It is proposed, *inter alia*, that "fuses and covers therefor" shall be dutiable at the rate of 35 öre per kg. (instead of 10 per cent. *ad valorem*); that duties of from 4 to 8 öre per kg. shall be placed upon lead-covered cables according to their diameter; and that "electric fireplaces" shall be classified with electric stoves, duties being placed upon them at varying scales according to the material used, and upon the heating elements a duty of 50 öre per kg. is suggested.

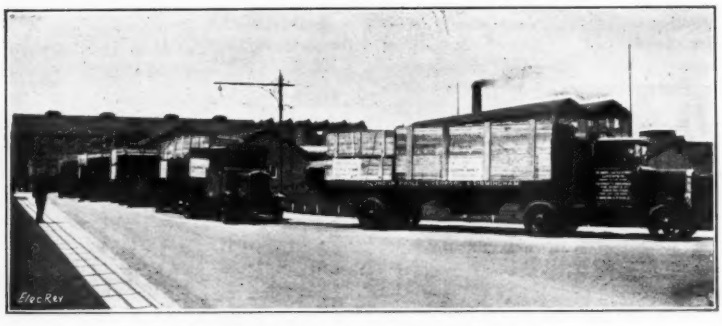
Recent Contracts.

The lighting and power installation at the new extension to The Polytechnic, Regent Street, has been entrusted to Messrs. FRANCIS POLDEN & Co., LTD., 56, Cannon Street, E.C.4. This company has also been given the contract for the work at the Clarendon Restaurant, Hammersmith Broadway, both as regards the ordinary lighting of the restaurant and the special lighting scheme in the dance

hall and Masonic temple. Messrs. Polden & Co. are also actively engaged on the large contract for the new boys' school at Bushey.

Electric Railway Equipment for India.

In the accompanying illustration is seen a convoy of "Scammell" lorries leaving the Rugby works of the British Thomson-Houston Co., Ltd., *en route* for Birkenhead Docks with equipment for the electrification of the main lines of the Indian State railways from Bombay to Poona and Bombay to Igatpuri, which is being carried out to the plans of Messrs. Merz & Partners. This shipment forms part of a large order placed with the British Thomson-Houston Co., Ltd., for complete sub-station and track sectioning equipment, the sub-stations being of the semi-automatic and supervisory controlled type. They will contain B.T.-H. 95,000-V switchgear and rotary convertors aggregating 65,000 kW, there being 52 machines of 1,250 kW each.



B.T.-H. Equipment en route to India.

New Belgian Companies.

Among the companies recently formed in Belgium are the following:—The Helios S.A., capital 300,000 fr., to manufacture and deal in electrical materials and accessories; Pettigrew and Merriman (Belgium) S.A., capital 200,000 fr., to manufacture and deal in wired and wireless telephone and telegraph apparatus and electrical apparatus generally; and the "Gand Radio," Etablissments José Mohin, capital 500,000 fr., for the wholesale and retail dealing in and manufacturing of radio apparatus and electric lamps.

New Catalogues and Lists.

VOLTA, LTD., Kern House, 36-38, Kingsway, W.C.2.—The "Volta Viewpoint" for June containing notes on various phases of selling "Volta" vacuum cleaners.

THE INDIA RUBBER, GUTTA PERCHA & TELEGRAPH WORKS CO., LTD., Silvertown, E.16.—List No. 40, containing particulars and prices of many kinds of "Silvertown" wires and cables, together with a separate sheet announcing reductions in prices.

MESSRS. E. P. ALLAM & CO., LTD., 107-109, Gray's Inn Road, W.C.1.—July stock list of new and second-hand d.c. motors for sale, hire, or hire-purchase.

INDUCTION MOTORS (LONDON), LTD., 110, Cannon Street, E.C.4.—A price list of single-phase motors—slip-ring and squirrel-cage.

MR. T. A. ROSE, 25, Milton Street, E.C.2.—An illustrated catalogue of small electrical accessories, including bells, torches, lampholders, hand and cycle lamps, medical coils, meters, and dry batteries.

MESSRS. ERNEST B. WESTMAN, LTD., 39, Lombard Street, E.C.3.—An illustrated brochure upon Swedish charcoal iron and steel.

MESSRS. DRAKE & GORHAM, LTD., Rockingham Works, Newington Causeway, S.E.1.—List No. 100, illustrating and describing the "Metesco" oil switch-fuse.

MESSRS. S. G. BROWN, LTD., Western Avenue, North Acton, W.3.—The "Brown Budget" for June, containing a well-illustrated description of the company's works and processes.

THE BRUSH ELECTRICAL ENGINEERING CO., LTD., Loughborough.—An illustrated brochure dealing with the company's core-type oil-immersed self-cooled transformers.

THE AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., Strowger Works, Liverpool.—Bulletin No. 300, containing a detailed illustrated description of the mechanism of the Strowger automatic telephone system and its operation. Special reference is made to installations in this country and overseas.

SIMPLEX CONDUITS, LTD., Garrison Lane, Birmingham.—List No. 1156, an abridged catalogue of standard conduits and conduit fittings of all kinds.

MESSRS. DAVID BROWN & SONS (HUDDERSFIELD), LTD., Park Works, Lockwood, Huddersfield.—"Technical Data Sheets." A series of leaflets in a folder, dealing with worm gearing for various applications. The series is priced at 1s.

VENNER TIME SWITCHES, LTD., 45, Horseferry Road, Westminster, S.W.1.—List No. 47, containing illustrated particulars of the "Venner-C. & S." remote water-level indicator for boilers, &c.; and a supplement dealing with its installation, testing and maintenance.

THE GREENWICH CABLE WORKS, LTD., Crooms Hill, Greenwich, S.E.10.—A card bearing "Ten Commandments of Electricity Service," incidentally advertising the company's wires and cables.

New Swedish Lamp Company.

A company with a minimum share capital of kr. 400,000 has been founded in Sweden with the object of manufacturing incandescent lamps by a method invented by the Swedish engineer, M. Ringhald Andersson, who is one of the founders of the company. The company also has the right to issue kr. 1,000,000 of preference shares.—*Reuter's Trade Service* (Stockholm).

Bankruptcy Proceedings.

C. H. DAVIES, 6, Stamford Arcade, Ashton-under-Lyne, Lancs., electrical engineer and contractor and general mill furnisher.—The first meeting of creditors of this debtor was held on June 21st, at the Official Receiver's office, Manchester, when the matter, being a summary case, was left in the hands of the Official Receiver as trustee of the estate. According to debtor's statement of affairs there were liabilities of £1,984, against assets of £114, leaving a deficiency of £1,871. Debtor attributed his failure to bad debts, bad trade, depreciation in value of shares, and forced sale of trade effects. He stated that he began business on his own account as an electrical engineer, but takings had fallen off owing to depression in trade. In May, 1922, he lost £200 by becoming interested with two other persons in the production of a weekly racing paper which proved a failure. He holds shares in cotton mill companies and an engineering company, and he is contingently liable for uncalled capital to the amount of £172.

H. WAGG, wireless accessories dealer, lately of 12, Holborn Viaduct, E.C.—The public examination of this debtor was held on June 19th, before Mr. Registrar Mellor, at the London Bankruptcy Court, the accounts showing liabilities of £169 and assets nil. In August, 1925, in partnership with one Pullen, the debtor began dealing in wireless accessories under the style of "Wagg & Pullen." The business, which was financed by a third party, proved unsuccessful, and was discontinued in August, 1927. The debtor attributed his insolvency to a general depression in trade, to the failure of the wireless accessories business owing to keen competition, and to lack of remunerative employment. The examination was concluded.

G. B. BANKS (Redditch Radio Co.), radio engineer, 16, Market Place, Redditch.—Receiving order made June 15th, on debtor's own petition.

J. H. PAINTER (Venables & Co.), electrician, 99, The Broadway, Cricklewood, N.W.—Application for discharge to be heard July 10th, at Carey Street, W.C.

R. FENTON, electrical engineer, 514, Sheffield Road, Chesterfield.—Trustee, Mr. L. A. Ward, Official Receiver, 4, Castle Place, Nottingham, released June 11th.

A. H. RICHARDSON (Radio Supplies), manufacturer of wireless sets, &c., 4, Rose Hill, Finedon, Northants.—Trustee, Mr. J. L. Wilkinson, Official Receiver, The Parade, Northampton, released June 8th.

A. B. GREGORY, wireless expert, 29, St. Albans Road, Seven Kings.—Receiving order made June 18th, on a creditor's petition.

E. G. GRAINGER (Grainger & Co.), wireless engineer, 38, Market Street, Ashby-de-la-Zouch.—Trustee, Mr. L. A. West, Official Receiver, 4, Castle Place, Nottingham, released June 15th.

G. C. LAZENBY, wireless engineer, 29, Old Town Street, Plymouth.—First and final dividend of 9d. in the £, payable July 6th, at Kimberley House, Holborn Viaduct, E.C.

Company Liquidations.

KYE, LTD., dealers in electrical goods, 1 and 3, Brixton Road, S.W.—Under the compulsory liquidation of this company the report of Mr. E. T. A. Phillips, Official Receiver, has been issued. The accounts show total liabilities of £11,314 (unsecured £9,025), assets valued at £1,754, and a total deficiency of £18,577 as regards contributories, the issued capital being £11,307. Mr. Phillips reports that the company was incorporated as a private company in August, 1923, under the name of "Spencers (Electrical), Ltd.," with a nominal capital of £1,000, and was promoted by C. N. Springthorpe for the purpose of carrying on the business of importing and exporting electrical goods. In September, 1925, the name of the company was changed to Kye, Ltd., and the nominal capital was increased to £12,000. B. R. Agazar (a director) states that from the company's inception, he had supplied it with imported electric lamps. In September, 1925, negotiations took place between him and H. J. Arbon with a view to the formation of a syndicate to undertake the eventual manufacture of electric lamps in England. It was agreed that the capital should be increased to £12,000, he undertaking that outstanding debentures should be surrendered. It was further arranged that Springthorpe should retire from the company; that the name of the company should be changed; and that Agazar should hand over to the company share certificates held by him in Selco, Ltd., Ferrow, Ltd., Spicer & Co., Ltd., and the F.W. Lamp Co., Ltd., which had been registered for the purpose of carrying on a similar business, and that all stocks of lamps held by him should be handed over to the company. As consideration he was to receive £3,000, which was to be re-in-

vested by him in the company, of which he was to be appointed managing director. On September 4th, 1925, the directors resolved that £3,000 be paid to Agazar for his interests in the four companies and his lamp interests in this country, but the agreement was never completed. On November 26th, 1925, the managing director reported to the board that a distribution scheme had been commenced which it was anticipated would greatly assist in promoting the sales of "Kye" lamps. The question of the company having a factory of its own for the manufacture of lamps was discussed, but left in abeyance. In November, 1926, a cash creditor obtained judgment for £1,500 advanced. In May, 1927, Agazar informed the directors that he would start a factory and would find the necessary money. In order that the company might have any credit that might arise from the purchase of the necessary plant, machinery and materials, these were ordered in the name of the company. Most of the invoices were paid by him out of his separate banking account. He had spent about £6,622, and the debt in respect of goods supplied was £2,563. The lamps were sold to the company at less than cost price. The present amount owing to him by the company is £1,858 in respect of lamps supplied. H. J. Arbon (director) states that he knew Agazar started the factory in the name of the Kye Manufacturing Co., but was not aware that the plant, machinery and materials were being ordered in the name of the company, although it was always intended that the company should take over the factory after it had been proved successful. The Hon. Christopher Roper-Curzon (director) states that he was aware of the installation of plant and machinery by Agazar at his own expense, and he understood that after the factory had proved a success it was to be taken over by the company at a price to be fixed by a third party. The trading accounts of the company showed a small net profit in the years ended March 31st, 1924 and 1925, but a net loss of £6,770 for the following year and a further net loss of £3,019 for the year ended March 31st, 1927. In February, 1928, judgment creditors for £1,763, levied execution upon the company's goods. The failure of the company is attributed by its officials to insufficient capital, heavy advertising expenditure, and loss of trade owing to defective lamps supplied from abroad. The Official Receiver arranged with Agazar to fulfil any orders received upon the undertaking that he would make an offer for the purchase of the goodwill of the company's business. Agazar subsequently paid £200 to the Official Receiver for the assets other than book debts and machinery and materials purchased in the name of the company. Agazar also paid a quarter's rent due and undertook the company's liability for current salaries. Mr. E. H. Hawkins, I.A., 4, Charterhouse Square, E.C., has been appointed liquidator by the Court with a committee of inspection.

ELECTRICAL SUPPLIES (LIVERPOOL), LTD.—Winding up voluntarily. Liquidator, Mr. R. R. Bailey, 10, Dale Street, Liverpool.—A meeting of creditors was called for June 27th at the Chartered Accountants' Library, 13, Union Court, Castle Street, Liverpool.

ERITH ELECTRICAL CONTRACTORS, LTD.—A meeting of creditors is called for June 29th, at 87-89, Aldgate High Street, E. Particulars of claims to the liquidator, Mr. L. G. Darling, 87-89, Aldgate High Street, E., by July 27th.

N.K. (BRADFORD), LTD.—A petition for the winding up of this company has been presented to the High Court by the Armorduct Cable Co., Ltd., and the Vulcan Electrical and Mechanical Co., Ltd., and will be heard in London on July 2nd.

POWER RECTIFIERS, LTD.—Winding up voluntarily. Liquidator, Mr. A. C. Eborall, Trafalgar House, Waterloo Place, S.W.1.—A meeting of creditors was to be held on June 28th, at Trafalgar House. Particulars of claims by October 1st to the liquidator,

HIGHTOWN ELECTRICITY CO.—A meeting of members is called for July 24th at 26, North John Street, Liverpool, to hear an account of the winding up from the liquidator, Mr. H. Lonsdale.

Private Arrangements.

MISS E. M. WALTON, trading as the Southport Electrical Specialities Co., 51, London Street, Southport.—A meeting of creditors was held recently at the offices of Messrs. A. J. Mawdsley & Co., solicitors, Southport. The statement of affairs presented showed ranking liabilities of £547, and net assets of £204, leaving a deficiency of £343. It was stated that the debtor commenced trading at the above address in 1921 in partnership with two others. The total capital subscribed was £250, of which the debtor contributed £50. During the first 12 months, the turnover was approximately £1,100. After 18 months, the two other partners retired, and were each paid £100. Since that date the debtor had traded alone. It was stated that the turnover had averaged £1,100 per annum, the gross profit being from 20 per cent. to 25 per cent. The property belonged to the debtor's mother, who was prepared to rank with the other creditors, and a cash claim for £50 was being withdrawn. It was decided that the business should be continued for the time being with a view to its being disposed of as a going concern. A committee was also appointed, and it was decided that if any creditors took proceedings, a deed of assignment should be executed.

HILLIER BROS., 52, Whitechapel Road, E.1, electrical engineers.—A meeting of creditors is to be held to-day (Friday) at the office of Mr. J. Mortimer, accountant, 12, Coleman Street, E.C.2, when a statement of affairs will be submitted.

Trade Announcements.

The London office address of Messrs. HOPKINSONS, LTD., Huddersfield, is now 34, Norfolk Street, Strand, W.C.2. Telephone: Central 4541, 4542, 4543; telegraphic address: "Valvestem, Phone, London."

An agency arrangement has been concluded between AUTOMATIC & ELECTRIC FURNACES, LTD., and Messrs. ALFRED HERBERT, LTD., for the sale of "Wild-Barfield" electric furnaces in Chile, Bolivia, and Peru.

In our issue of May 25th (p. 917), we recorded the registration of F. PARKS, LTD., whose objects included "the business of wholesale and retail manufacturers of and dealers in lamps and lamp-shades." Messrs. Parks point out that although their articles of association include very wide powers, as is usual, they intend to carry on a wholesale business only.

The METROPOLITAN-VICKERS ELECTRICAL CO., LTD., informs us that its Cardiff office is now at 89 and 90, Frederick Street.

The address of ELECTRIC CONTROL, LTD., is now 32, Old Queen Street, S.W.1. Telephone: Victoria 6125; telegrams: "Elecontrol, Parl, London."

The telephone number of Messrs. MARRYAT & PLACE, LTD., is now Holborn 8181 (five lines).

METRO-VICK SUPPLIES, LTD., London, W.C.2, Manchester and branches, announces that all district offices, works and stores will be closed on Saturday, June 30, for annual stock-taking.

The MULLARD WIRELESS SERVICE CO., LTD., is opening a new depôt on July 2nd at 16, Clayton Street West, Newcastle-on-Tyne. Telephone: City 83; telegrams: "Mullard, Newcastle." Mr. W. J. Maxwell has been appointed manager of the depôt. The existing depôt will be closed.

Messrs. FRANK GALE & SONS, of 133, Friar Street, Reading, have acquired the stock, plant, and goodwill of the Reading Radio Installations, of 17, King's Road, and the business has been transferred to Friar Street.

New offices have been opened by BROOK MOTORS, LTD., at 73, Victoria Street, Bristol, to serve that city and the South Wales area. The company has also removed its Leicester branch to Allen House, Newark Street, Leicester.

The address of Messrs. WALTER PARKINS & Co. is now Goldthorn Hill (Dudley Road), Wolverhampton. (Telephone: Penn 6464.)

The works of Messrs. HIGGS MOTORS, Witton, Birmingham, will be closed to-morrow (Saturday) for the annual works outing.

British Patent System Condemned.

The report of the British Science Guild presented at last week's annual meeting contained a passage urging the necessity of the reform of the patent system. It was pointed out that a British patent did not give the security which a German or American patent afforded. Invalid patents were freely granted, and a manufacturer could spend large sums on plant, &c., and find the reward of his enterprise being reaped by his rivals, with no means of redress. The cost of patents was also said to be excessive, and the use of the system as a means of raising revenue was condemned.

The New G.E.C. Sheffield Branch.

The Sheffield branch of the GENERAL ELECTRIC CO., LTD., was removed to Fitzalan Square some time ago. The reconstruction of the new premises has now been completed and they contain ample showroom accommodation, large stockrooms and a convenient trade counter. The main showroom, on the first

The Trade Counter at the G.E.C. Sheffield Branch.

floor, extends the whole width of the building frontage and is devoted almost entirely to a comprehensive display of lighting fittings, period designs being shown in a separate room. Other rooms are employed to exhibit "Magnet" domestic appliances and radio apparatus. The stockrooms are in the basement, one of them being devoted to conduit. The trade counter (illustrated herewith) is reached by the main entrance, and the latter is flanked by show windows.

D

For Sale.

Mr. H. J. Shaw will sell by auction on July 4th, at 13, High Holborn, stocks of electrical and wireless goods, &c. South Shields Board of Guardians invite offers for surplus boiler plant, &c. Weymouth and Melcombe Regis Electricity Department invite offers for three Lancashire boilers. Newcastle-upon-Tyne Electric Supply Co., Ltd., has for disposal its surplus stock of d.c. meters. (See our advertisement pages to-day.)

Railway Electric Cooking.

Owing to the success of the all-electric restaurant cars on the "Flying Scotsman," the L.N.E.R. is to provide electric charging plants at thirteen stations, in addition to those in use at King's Cross, Leeds, and Edinburgh. The installation of these plants will be followed by an extension of electric restaurant car services.—*Financial News.*

Marconi Patents in the United States.

An *Exchange News* message from Washington says that in the hearing before the Federal Trade Commission of charges of monopoly by various companies connected with the radio industry, counsel for the Radio Corporation of America told the Commission that it was through the formation of the Radio Corporation that the monopoly being created at that time by the British Marconi Company was broken.

A New Use for Cable Reels.

The MACINTOSH CABLE CO., LTD., has sent us a picture of a sturdy chariot built up with Macintosh cable reels by Mr. A. J. Howard, borough electrical engineer of Taunton, for his small sons. It appears to be quite a businesslike vehicle.

New Radio Apparatus Showrooms.

R.I. & VARLEY, LTD., have recently opened a showroom upon the ground floor of their premises, Kingsway House, Kingsway, W.C.2. This is purely for demonstration purposes; although the public is invited to inspect the apparatus which is on view no sales are made in the showroom. For the trade there is a special counter in the rear of the premises. Arrangements are made by the company to test sets designed by the radio Press.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price June 26th.	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5½d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£62	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3½d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£95 to £100	...
b	,, Wire ... ... per lb.	1/3 to 1/9	...
b	,, Sheet ... ... ,,	1/3 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—		
	Grade I ... ... per ton net.	£193	£8 dec.
	Grade II ... ... ,, ,,	£185	£5 dec.
	Grade III ... ... ,, ,,	£73	£2 dec.
c	Brass (rolled metal 2" to 12" basis) per lb.	9¾d.	...
c	,, Tubes (solid drawn) ... ... ,,	11¾d. to 1/-	...
c	,, Wire, basis ... ... ,,	9¾d.	...
c	Copper Tubes (solid drawn) ... ,,	1/0½	1d. dec.
c	,, Bars (best selected) ... per ton.	£94	...
c	,, Sheet ... ... ,,	£94	...
c	,, Rod ... ... ,,	£94	...
d	,, (Electrolytic) Bars ... ,,	£69	£1 inc.
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£79	£1 inc.
d	,, ,, H.C. Wire per lb.	9¼d.	¼d. inc.
f	Ebonite Rod ... ... ,,	2/8 to 2/6	...
f	,, Sheet ... ... ,,	2/8 to 2/6	...
n	German Silver Wire ... ... ,,	2/9	...
h	Gutta-percha, fine ... ... ,,	6/8	...
h	India rubber, Para fine ... ... ,,	11d.	½d. inc.
l	Iron Pig (Cleveland No. 3.) ... per ton.	65/-	...
l	,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£22	15/- dec.
g	Mercury ... ... per bot.	£22	15/- dec.
e	Mica (in original cases) small ... per lb.	3d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/3	...
p	,, ,, rolled strip & sheet ,,	1/3½	...
p	,, ,, wire... ... ... ,,	1/3½	...
e	Platinum ... ... per oz.	£17 15s.	...
d	Silicium Bronze Wire ... ... per lb.	10½d.	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton.	£205 10s. to £207 10s.	£6 dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/10	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Crossley Exhibits at Milan.

At the recent Milan Exhibition, Messrs. CROSSLEY BROS., LTD., exhibited a number of their engines. The models shown included an 80-b.h.p. horizontal cold-starting heavy-oil engine; vertical two-stroke heavy-oil engines with separate air-scavenging pumps; and a number of small petrol-paraffin engines ranging from 2 to 20 b.h.p.

Award for Petters, Ltd.

The "Calibrater" mechanical sight-feed lubricator, which was exhibited at the recent Royal Cornwall Show by Messrs. PETTERS, LTD., was awarded a bronze medal.

Deed of Assignment.

Mr. V. D. KITSON, electrical engineer, 63, West Regent Street, Glasgow.—Particulars of claims by June 30th to the trustee, Mr. J. S. Sutherland, 141, Bath Street, Glasgow.

Great Britain's Radio Exports.

Statistics of British exports of radio apparatus during April are given by the *Wireless Trader*. The total value (excluding re-exports) was £96,164 (including valves £15,317). The leading customer was Australia, whose share was valued at £17,045 (valves £6,343). The next in order was France, which took goods to the value of £8,945 (valves £14). Other important markets were the Netherlands, £7,106 (valves £70); Spain, £5,616 (valves £134); India and Burma, £5,042 (valves £1,166); and Germany, £4,536 (valves £58).

German Cable for Japan.

It is stated that the North German Marine Cable Works Co., Nordenheim, has received an order from the Japanese Government for a marine cable 90 km. in length. This is the first time since the war that the Japanese Government has placed a contract of this extent in Germany.

Lighting and Power Notes.

Aylesbury.—LOANS SANCTIONED.—The Town Council has received sanction to a loan of £20,879 to cover prospective expenditure for electricity purposes during 1927-28, and to a loan of £4,911 in respect of over expenditure on the electricity undertaking.

A canvass is to be made of residents at Bierton, with a view to giving a supply of electricity to the parish.

Barnsley. — LOAN SANCTIONED. — The Town Council has applied for sanction to a loan of £7,356 for extensions to distributing and public lighting mains. Mains are to be laid in additional streets for public lighting, including reconstruction of the public lighting control, at an estimated cost of £4,881.

Bradford.—PROPOSED CHANGE-OVER.—The Corporation has applied for consent to alter the pressure of electricity supply from d.c. at 460 V to a.c., 3-phase, 50 cycles, 400 V.

Burton-on-Trent.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. T. Hall) for the year ended March 31st last record a total income of £97,173, as compared with £102,700 in the preceding year, the decrease being due to reductions made during the year in the electricity charges. Working expenses amounted to £48,703, as against £62,611, leaving a gross profit of £48,470 (£40,089), and after payment of capital charges there was a net surplus of £6,152, of which £2,481 was transferred to the district fund and the remainder placed to the renewals fund. The previous year's working resulted in a surplus of £4,590. The capital expenditure during the year amounted to £95,882, this being principally due to new plant, extensions of e.h.p. lines, and new l.p. distributors. The electrical energy sold increased from 15,729,071 to 17,334,309 kWh, and the maximum supply demanded from 5,750 to 6,100 kW. The average price obtained per kWh fell from 1.52d. to 1.31d. A new 7,500-kW set was put into commission on March 1st last, raising the capacity of the station to 19,000 kW.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—The first generator of the Paugan (Quebec) hydro-electric plant of the Gatineau Power Company has been delivered. The power house, which is situated on the Gatineau River 33 miles from Ottawa, is designed for eight sets of 34,000 h.p. each. Twenty-six miles below the Paugan development the Chelsea and Farmers hydro-electric plants of the Gatineau Power Company are in operation, and are delivering power to the Gatineau newsprint mill of the Canadian International Paper Company. These two plants are designed for a total of 290,000 h.p., of which 174,000 h.p. is now installed.

Continental.—BULGARIA.—The Compagnie d'Electricité de Sofia et de Bulgarie has recently completed and put in operation a new steam-operated power station with a capacity of 12,800 kW at Kourilo, near Sofia. The station, which has been designed for an ultimate capacity of 30,000 kW, also includes transformers for stepping up the electrical energy from 6,000 to 35,000 V, at which pressure it is transmitted to Sofia, a distance of 7½ miles, where it is stepped down to 7,000 V. The demand for power supply is increasing so rapidly that

although the station has only been in operation a few months, it has already been decided to install a third turbo-generator with a capacity of 6,400 kW. The company now owns 47 miles of 7,000 V distribution and 200 miles of l.p. mains and is supplying electricity to 33,127 consumers.

Dalbeattie.—ELECTRICITY SUPPLY.—The Town Council has remitted to the Lighting Committee a letter from the Dalbeattie Electric Light and Power Co., Ltd., asking for sanction to the erection of an additional overhead line and offering to supply electricity for street lighting.

Exeter.—ELECTRICAL PROGRESS.—The City electrical engineer (Mr. H. D. Munro) reports that during the past year there has been a rapid increase in the demand for all classes of electricity supply in the area, and the bulk supply to Crediton has also been commenced. Over 1,000 new consumers have been connected. The total sale of electricity for the year has increased by more than 1,000,000 kWh over that of the previous year. During the year 2½ miles of h.p. feeder mains and nearly 10 miles of l.p. distributors were laid, bringing the total length of mains laid throughout the area to 120 miles. A hiring scheme for domestic electric cookers was adopted early in the year, and about 100 cookers have been connected. The net profit on the undertaking for the year was £17,687.

Grimsby.—LOAN.—The Corporation Electricity Committee is applying for sanction to borrow an additional sum of £1,700 in connection with the laying of cables to Humberstone, &c.

Harrogate.—LOAN.—Application is being made by the Town Council for sanction to borrow £5,600 for a new sub-station at Prospect Hill.

NEW PLANT.—The Town Council has decided to increase the plant at the generating station by the installation of one 10,000-kW set.

Irish Free State.—RATHMINES (CO. DUBLIN).—At a recent meeting of the Urban District Council a letter was read from the Electricity Supply Board relative to the Council's proposal to install an additional generator to meet the peak demand during the next winter, in which the Board maintained that the new plant was not necessary. The chairman of the Lighting Committee said that the technical officer had informed the Committee that a continuous supply of electricity could not be guaranteed next winter unless an additional generator was installed. The Board's letter was referred to the Lighting Committee for full consideration.

Isle of Man.—ELECTRICITY SUPPLY.—Messrs. Crompton Parkinson, Ltd., have submitted to the authorities a scheme for supplying electricity to the island, excluding Douglas. The proposal provides for the establishment of power stations at Castletown and Ramsey, and the use of overhead lines wherever possible.

Leigh (Lancs.).—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. J. B. Hudson) for the year ended March 31st last, show a total income of £51,485, and working expenditure of £29,560, leaving a gross profit of £21,925. The previous year's figures were: Income, £44,292; working expenses, £34,840; gross profit, £9,452. After meeting capital charges there was a net surplus of £9,447, as compared with a deficit of £3,411 in the preceding year. The electrical energy sold increased from 7,230,595 to 8,454,911 kWh, and the maximum supply demanded from 3,780 to 4,476 kW. The average price obtained per kWh fell from 1.42d. to 1.37d. The electricity charges were reduced in July last, and again in January, while further reductions have been approved which will come into operation from July 1st next, when the charges for any class of supply will in no case exceed those in operation in pre-war days.

Lichfield.—LOAN SANCTIONED.—The City Council has received sanction to a loan of £15,005 for electricity purposes, including the laying of cables in the Friary Roads. This is part of a loan of £21,422 applied for, and the Electricity Commissioners have asked for further details with regard to the balance.

Leeds.—YEAR'S WORKING.—We have received from Mr. C. Nelson Hefford, general manager and city electrical engineer, a copy of his report, together with the abstract of accounts, on the working of the electricity undertaking for the year ended March 31st last. The total revenue amounted to £681.265, and working expenses were £242,155, leaving a gross profit of £439.109. The figures for the preceding year were:—Income, £637,200; working expenses, £340,120; gross profit, £297 080. Capital charges absorbed £130,007, leaving a balance of £309,102, out of which the following appropriations were made:—Contributions to consolidated loans fund, £108,759; contributions to capital, £63,157. There was therefore a net surplus of £137,186, as compared with a deficit of £14,110 in 1926-27. The capital expenditure during the year amounted to £344,680, and the total now expended on the undertaking stands at £4,733,912. The sales of electrical energy increased from 106.415,644 to 120.385,212 kWh, and the maximum supply demanded from 47 700 to 54,500 kW. The average price obtained per kWh fell from 1.44d. to 1.36d. During the year sanction was received to the erection of a new power station at Kirkstall, and to a loan of £500,000 towards the sum of £865,000, which is the estimate for the first portion of the works. The plant will include two 25,000-kW sets, and three 160,000-lb. boilers, using powdered fuel and working at a pressure of 490 lb. per sq. in. The number of applications received under the assisted wiring scheme, which was commenced in May, 1927, was 7,901, and 3,397 houses were connected to the mains.

Lincolnshire.—ELECTRICITY SCHEME.—Although a great deal of controversy has been occasioned by the scheme projected by Mr. R. Borlase Matthews for providing an electricity supply over a wide area in Lincolnshire, opposition upon the part of public bodies and private individuals has become somewhat modified in the light of the fuller information recently forthcoming. At the last meeting of the Gainsborough Rural District Council, Mr. D. Edwards, for Mr. Matthews, explained that should the Special Order be granted, work would be proceeded with immediately in the north-western portion of the county, as a good deal of that area had to be electrified within two years; the authorities there were the only ones which had not yet given consent to the scheme. Centralised management would prove an effective factor in the economic working of the undertaking, which should be considered under the following heads: (1) Electricity could be obtained by residents at a maximum flat rate of 8d. per kWh. or, alternately, at a cost of 15s. per room (omitting bedrooms), plus 1d. per kWh. (2) Five lights would be offered to each house without capital charge. (3) The immense possibilities offered for rural development and the possibility of electricity supplies for farmers. He appealed to the Council to consider seriously the advantages of the scheme to residents in rural areas.

London.—BATTERSEA.—The Borough Council Electricity Committee proposes that the extension of the electricity generating station shall be formally opened by the Mayor on July 7th.

HACKNEY.—The Borough Council Finance Committee has recommended that application be made for sanction to a loan of £18,710 for electricity purposes.

ELECTRICITY CHARGES.—The Highways Committee of the L.C.C. has received a communication from the Electricity Commissioners stating that the following standard prices have been determined by them: Brompton and Kensington Electricity Supply Co., Ltd.: Street lighting supplies, 2d. per kWh; supplies to private consumers, 4.604d. Kensington and Knightsbridge Electric Lighting Co., Ltd.: 1.295d. and 3.004d. Notting Hill Electric Lighting Co., Ltd.: 2d. and 4.168d. Westminster Electric Supply Corporation, Ltd.: 1.064d. and 2.766d. Chelsea Electricity Supply Co. Ltd.: Supplies to private consumers, 4.423d. per kWh. St. James' and Pall Mall Electric Light Co., Ltd.: Private consumers, 2.917d. per kWh. The Commissioners add that their decision as regards the standard prices of the remaining companies will be communicated to the Council as and when they are determined.

HAMPSTEAD.—*Year's Working.*—The report of the borough electrical engineer (Mr. J. Leadbeater) on the working of the electricity undertaking for the year ended March 31st last shows a total revenue of £162,170, as compared with £159,958 in the preceding year. Working expenses amounted to £107,652, as against £121,945, leaving a gross profit of £54,518 (£38,013). After deducting loan charges, there was a balance of £44,965, from which contributions to capital account totalling £31,388 were made, leaving a net surplus of £16,039, as compared with £1.504 in 1926-27. The sales of electrical energy increased from 15,777,271 to 17,487,668 kWh. and the maximum supply demanded from 9,270 to 10,700 kW. The revenue obtained per kWh fell from 2.43d. to 2.23d.

Lowestoft.—LOAN SANCTIONED.—In connection with the bulk supply, the Corporation Electricity Committee has received sanction to a loan of £6,400 for the provision of transformers, switchgear, and cable connections. The Electricity Commissioners intimate that they will give further consideration to the Council's application for sanction to a loan of £3,000 for building work and foundations upon receipt of further particulars.

New Zealand.—HYDRO-ELECTRIC DEVELOPMENT.—The *Australasian Electrical Times* reports that it is expected that the Waikaremoana scheme of the N.Z. Government will be supplying hydro-electric power to Wanganui, Wellington Province, and Hawkes Bay not later than June, 1929, as the Waikaremoana works and the transmission line to Napier will then be complete. Lake Waikaremoana is drained by the Waikare-taheke River, a tributary of the Wairoa. The present stage of the scheme simply collects, by means of a weir and open race, sufficient water from the tributary for the requirements of the plant and diverts it into Lake Kaitawa, whence it is conveyed by a tunnel 11 ch. in length to the surge chamber, from which pipe lines run to the power house on Lake Whakamarino, a total drop of 645 ft. This stage is known as No. 1 development, and will give an ultimate output of 60,000 kW, although only two 20,000-kW sets are being installed. Future developments will include the building up of Lake Whakamarino to increase its storage capacity to enable the tail-waters from No. 1 power house to be conserved for use in a power house on the banks of the Waikaretaheke, 369 ft. below. The final development proposed is an interesting one. Lake Waikaremoana overflows during part of the year only, but there are under-water fissure outlets which have a constant flow. These will be sealed, a tunnel will be driven beneath the lake floor, and contact will be made from the latter by means of a hole sunk with the aid of a caisson. This tunnel will be the source of supply for No. 3 power house, which will be situated at a greater altitude than Nos. 1 and 2. The full development of Waikaremoana will yield 150,000 kW.

namely, 60,000 kW from No. 1 power house, where the turbines will operate under 645 ft. head; 40,000 kW from No. 2, with 369 ft. head, and 50,000 kW from No. 3, with 430 ft. head.

Paignton.—STREET LIGHTING.—The Urban District Council has decided to invite the Torquay and Paignton Gas Co., and the Paignton Electric Light & Power Co., Ltd., to submit tenders for the lighting of public lamps in the district for a period of seven years.

Preston.—ELECTRICITY EXTENSIONS.—The Corporation Electricity Committee proposes increasing the capacity of the Ribble power station from 50,000 kW to 60,000 kW, and the Electricity Commissioners have approved the proposal. The new scheme provides for the substitution of two new steam turbines of the latest two-cylinder type, and the increasing of the capacity of the four sets in the station from 12,500 kW to 15,000 kW each. The cost of the scheme is estimated at £46,000, and application is being made for sanction to the borrowing of this amount.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

HAMILTON.—Lighting: Flat rate, from 6d. to 5½d. per kWh; contract (multi-tariff rate), the "unit" charge from 1½d. to 1d. Power: Varying from 2½d. per kWh for the first 2,000 kWh per quarter to ¾d. per kWh for over 57,000 kWh.

LUTON.—The 10 per cent. increase in charges for electricity in the borough to be discontinued, and the charges in added areas to be as in the borough.

TEWKESBURY.—*Tewkesbury Electric Light Co., Ltd.*—Lighting: 7d. per kWh. Cooking and heating: 1½d. per kWh. Power: 2d. per kWh.

HOYLAKE AND WEST KIRBY.—Lighting: First 500 kWh, from 6½d. to 6d. per kWh. Meter rents: A reduction of 3d. per quarter.

ASHTON-UNDER-LYNE.—Lighting: Mills, factories and public buildings (except large supplies under agreement), and d.c. power, a reduction of ½d. per kWh. Ordinary lighting: Varying from 5d. per kWh for the first 250 kWh per quarter to 3d. per kWh for over 2,000 kWh, less 2½ per cent. discount for prompt payment. Two-rate tariff: High rate, as ordinary lighting tariff; low rate (11 p.m. to 4 p.m.), 2d. per kWh, less 2½ per cent. Rateable value system: 15 per cent. of the rateable value per annum, and ½d. per kWh, with a minimum rateable value of £15.

BELFAST.—Electricity for all purposes: A discount of 5 per cent. for prompt payment of accounts.

LONDON.—The Kensington & Knightsbridge Electric Lighting Co., Ltd., announces that from Michaelmas, 1928, the following scale of electricity charges will come into operation: Lighting—First 4,000 kWh per annum, 4½d. per kWh; all energy in excess of this amount, 3d. per kWh. Power—The fixed charge of 7s. 6d. per rated h.p. per quarter to be withdrawn, the "unit" charge being 1d. Cooking and heating—1d. per kWh. Water heating at off-peak periods—½d. per kWh.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by W. H. Burton, E. Burton, and W. Burton, authorising them to supply electricity in parts of the rural districts of Aysgarth and Reeth; the Hawes Electric Lighting Co., Ltd., to supply in part of the rural district of Aysgarth; John C. Bannister & Co., Ltd., to supply in the rural district of Easingwold; and the Shropshire, Worcestershire & Staffordshire Electric Power Co., to supply in the urban and rural districts of Bromyard, and part of the rural district of Ledbury.

The Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Weald Electricity Supply Co., Ltd., to supply electricity in parts of the rural districts of Uckfield, Hailsham, Tonbridge, Maidstone, and Hollingbourn.

Taunton.—LOAN.—The Town Council is applying for sanction to the borrowing of £19,000 for the following works:—2,500-kW turbo-generator set, complete with foundations, switchgear, connections, and accessories, £16,000; feed pump, £400; circulating water discharge pipe, £1,000; two 1,000-kW transformers for converting single-phase energy to three-phase, with necessary switchgear and connections, £1,600.

Tynemouth.—LOANS.—The Corporation Electricity Committee is applying for sanction to the borrowing of £10,000 for mains and services and £1,000 for transformers and switchgear.

ELECTRICITY IN BULK.—The Committee has arranged terms with the Newcastle Electric Supply Co. for a bulk supply of electricity to the borough.

Watford.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to a loan of £63,500 for extensions to the generating station.

West Ham.—INQUIRY.—An inquiry was held at the Town Hall on June 19th, by Col. T. C. Ekin, for the Electricity Commissioners, into the application of the Corporation for sanction to a loan of £282,800 for electricity purposes. There was no opposition. Mr. F. W. Purse (borough electrical engineer) stated that the loan was made up as follows: L.p. mains, £225,000; h.p. cables, £10,000; sub-stations, £10,000; services, £35,000. He had allowed £5 per service, and he estimated 7,000 services or more. The number of consumers connected up weekly was about 80, instead of 40, as had been anticipated, and a supplementary loan would be necessary, unless the work was paid for out of revenue, if that rate of progress continued. About 140 miles of l.p. cable would have to be laid. There would be a cable in every street, and if the load demanded it additional ones would be laid. In his additional report he estimated 8,000 consumers, a revenue from new consumers of £16,000, and a total of £23,431 when the work was completed. There were 2,339 electric street lamps and 1,867 gas lamps in the borough, and it was proposed to change over the remaining gas lamps to electric lighting. The Commissioners will give their decision in due course.

Whitehaven.—LOANS.—The Town Council has applied for sanction to loans of £2,000 for services and £1,500 for meters.

Tramway and Railway Notes.

Continental.—HUNGARY.—The work of electrifying portions of the Hungarian railways is making rapid progress. Trial trips with the first electric locomotives on the stretch between Budapest and Alag are now being made. The electrification of the main line Budapest-Vienna will be completed in the spring of 1930. It is stated that the new trains will travel at an average speed approaching 60 miles per hour over the whole distance, which will be covered in about three hours instead of the present time of 4½ hours.—*Reuter* (Vienna).

FRANCE.—Work on the extension of the Paris underground railways has been making steady progress since the war, and the opening of the new central station at the Carrefour Drouot, at the junction of the Boulevard Haussmann with the Grands Boulevards, will take place shortly. The new station will serve two lines, and when the new branch under the Grands Boulevards is completed, will be the central point of a system traversing Paris practically in a straight line from east to west. Various other branches are now under construction, totalling 11 miles in all, and they should be completed by 1935. The underground railways will then consist of 77½ miles of line, all following various main arteries of the city, below the ground. Only another ten miles would then be left to complete the plan drawn up in 1896. The next step will, it is hoped, be the extension of the underground railways to the suburbs.—*Reuter* (Paris).

BELGIUM.—Plans are being prepared for the electrification of the local railway between Ghent, Somergem, and Ursel.

Croydon.—TRACK RENEWAL.—The Corporation Tramways Committee is to renew part of the tramway track in London Road at a cost of £600. This portion was not renewed during the reconstruction of the track in London Road, and the present rails were laid nearly 20 years ago.

TRAMCAR IMPROVEMENTS.—The Committee has had under consideration the desirability of constructing top coverings for the bogie cars now in operation upon the Thornton Heath route, and has recommended that a top cover be constructed on one of the cars as an experiment, at an estimated cost of £450.

Sheffield.—NEW DEPOT.—Considerable progress has been made with the construction of the Corporation's new tramcar depôt and motor-omnibus garage in Tenter Street, and the portion which is to house the tramcars is nearing completion. The cars will run from West Bar Green into the ground floor, which will provide accommodation for approximately 80 cars.

Telegraph and Telephone Notes.

Australia.—RADIO DEVELOPMENTS.—Important developments in Commonwealth wireless communication are foreshadowed in the proposal to establish a station at Canberra, with a range of 5,000 miles, enabling the Government to have ready means of communication with the remainder of the Empire and ships at sea. The scheme is intended to supplement the short-wave "beam" radio and submarine cable services, and the *Financial News* says that Mr. Brown, Director of Postal Services, is at present in London consulting the authorities on the subject of the new station, which is to be the last link in the Empire chain, enabling rapid direct communication in all circumstances.

Brazil.—TELEPHONE SERVICE.—At the beginning of the present year there were 39,131 subscribers to the telephone system in the city of Rio de Janeiro and 23,439 in Sao Paulo.

Canada.—TELEPHONE PROGRESS.—A report issued by the Dominion Statistical Department shows continued progress in telephone development in Canada. During the past ten years the total number of instruments in use increased by 116 per cent.; while, in addition to the Bell Telephone Company of

Canada and the three provincial systems of Manitoba, Saskatchewan, and Alberta, 2,479 smaller systems are worked by private municipal and co-operative companies. On January 1st, 1927, there were 1,201,000 instruments in Canada, representing an annual increase of 58,132 and a density of 128 telephones per 1,000 population. England's telephone density is only about 32 per 1,000.

Colombia.—TELEPHONISTS' STRIKE.—A message last week from Bogota (Colombia) state that the British Bogota Telephone Co., Ltd., has accepted the demands for increased wages of the operators on strike. It is expected that the service will recommence as soon as the agreement has been registered officially.

Irish Free State.—TELEPHONE NIGHT CALLS.—In Dail Eireann last week, Mr. Heffernan, Parliamentary Secretary to the Minister for Posts and Telegraphs, answering Dr. O'Dowd, said that the provision of a night telephone service in rural areas for clergymen, doctors, and nurses, would involve the provision of a permanent night staff out of all proportion to the revenue anticipated. The Department was experimenting with a new type of semi-automatic telephone apparatus designed to meet this problem of catering for night calls, but some months would have to elapse before the investigations would be completed.

Poland.—TELEPHONE CABLES.—The *Financial News* learns that the American-Polish Chamber of Commerce announces that the Polish Government is negotiating with the International Telephone and Telegraph Co. for credit aggregating 300 million zloty (about £6,800,000), the proceeds of which would be used for the installation of underground cables to replace the overhead cables now used.

Simultaneous Telephony and Telegraphy.—BRIDGWATER EXPERIMENTS.—Experiments which are now being made at the Marconi "beam" station at Bridgwater indicate that wherever a short-wave "beam" telegraph service is conducted a telephone service may also be established, while the new "multiplex" apparatus that has been developed enables one set of apparatus and aerials to conduct simultaneous telephone and telegraph services. During the present tests at Bridgwater, a party listened to dance music which was being received from Montreal at the same time, and with the same apparatus and aerials, as two Morse telegraph services from Montreal. The demonstration was given to Mr. David Sarnoff, vice-president and general manager of the Radio Corporation of America, and Mr. W. A. Winterbottom, traffic manager of the Radio Corporation of America, by Senatore Marconi and Mr. G. A. Mathieu, the research engineer who has been working in close collaboration with him in the development of the Marconi-Mathieu multiplex system. The Bridgwater "beam" station is the receiving station for the commercial telegraph service between this country and Canada, and was built in 1926 by the Marconi Company for the General Post Office, which has allowed the use of it for the present experiments, which do not impede the commercial telegraph service, for another channel is used to carry on the present traffic between Canada and England. "With the multiplex system the wireless telephone channel can be run in connection with the telegraph channel and might be regarded as a kind of 'bonus,' for instead of having only one channel of communication between each transmitter and receiver the multiplex system gives three or four at the same time."

South America.—TELEPHONY.—Telephonic communication has been inaugurated between Santiago, Buenos Aires, and Montevideo. The service is being worked by the Chile Telephone Company, recently acquired from British interests by the International Telephone and Telegraph Company in conjunction with the All-America Cables, Inc.

Switzerland.—TELEPHONE SERVICE.—A new telephone exchange has lately been completed in Interlaken, in which town there is now one subscriber for each 22 of the local population, as against one for each 23.4 persons in the whole country.

The Telephone Service.—NEW EXCHANGE AT GARSTON.—A New No. 10 c.b. manual exchange has just been equipped for the British Post Office at Garston, a seaport on the River Mersey, some six miles from Liverpool. It has a present capacity of some 1,400 lines with provision for 1,800 ultimate growth. The switchboard comprises 17 two-panel sections, flanked by a cable-turning section equipped with meters at one end, and a cable-storing section at the other. From left to right there are four junction positions, one special "A" position, ten subscribers' positions, one filter record position, and one test and plugging-up position. The switch room equipment also includes a combined supervisor's and monitor's desk. The main batteries, in duplicate, were manufactured by the Alton Battery Co., Ltd. Two motor-generator sets, manufactured by Newton Bros. (Derby), Ltd., furnish the charging current. The ringing machines also are in duplicate, having an output of 1 ampere each. The whole of the equipment, with the exception of the batteries and motor-generators, was manufactured and installed to the order of the British Post Office, by the Automatic Telephone Manufacturing Co., Ltd. The present population is of the order of 25,000 and, with 5.6 telephones per 100 inhabitants is not badly served by comparison with Liverpool proper, which only boasts 3.9 telephones per 100.

United States.—TELEPHONE SERVICE.—The latest statistics show that although there are five times as many telephones per hundred of the population in the United States as in Great Britain, saturation point is not in sight. The gain in telephone installations has ranged, during the past five years, from 700,000 to 770,000, compared with an annual gain of about 400,000 in pre-war years. There has, however, been a change in the character of the gain: private-branch exchanges and extension stations have increased considerably, but the gain in main stations has decreased. An impression of the volume of work necessary to handle this business may be gathered from the fact that during 1927 it was necessary to make about 4,000,000 new connections and 3,300,000 disconnections to obtain a net gain of 700,000 installations.

Radio Notes.

Australia.—NEW BROADCASTING COMPANIES.—The formation of two new Australian broadcasting companies is announced. One is the Dominions Broadcasting Pty., Ltd., registered in Melbourne with a capital of £200,000. It is to acquire the businesses carried on by the Broadcasting Co. of Australia Pty., Ltd., and the Associated Radio Co. of Australia, Ltd. The other is the New South Wales Broadcasting Co., Ltd. (Sydney), capital £100,000. This company will acquire the broadcasting licences of 2FC, Ltd., and 2BL, or Broadcasters (Sydney), Ltd.

Germany.—"PIRATES."—Radio "pirates" (Schwarzhörer) to the number of 551 were sentenced from January to March, 1928, says *World-Radio*, compared with 558 during the same period in 1927 and with 618 in the last quarter of 1927.

South Africa.—NEW LEGISLATION.—An important Bill, introduced by the Minister of Posts and Telegraphs, to amend the South African Radio Act of 1926, has been introduced in the Union House of Assembly, says *World-Radio*. A section of the old Act is to be repealed and another substituted which provides that any person who erects, maintains, uses, or has in his possession any radio apparatus without an appropriate licence, or permit, as required by the Act, shall be liable to conviction with the penalty of a fine and/or confiscation of apparatus and cancellation of licence. Sub-section 2 of the Bill prohibits the sale, or gift, or supply, of any radio apparatus from one person to another unless he holds a licence to deal in, or a permit to transfer, such radio apparatus, issued by the Postmaster-General. (Such licences, each of which shall expire on the 31st day of December next succeeding the date of its issue, and such permits may be granted free of charge by the Postmaster-General), and under sub-section 3 it is an offence for a person licensed under sub-section 2 to deal in radio apparatus, if he sell, give, or in any manner whatever supply, any radio apparatus (*a*) to any person who is not the holder of an experimenter licence, a broadcasting licence, or a listener's licence; and (*b*) unless he keeps a true record of such transaction by means of an invoice written by him or under his direction and signed by him at the time of the transaction, setting out the date of the transaction, his name and address and the name and address of the person supplied. The last clause of the amending Bill attempts a new definition of the words "radio apparatus." It says: "'Radio apparatus' means any radio aerial, radio crystal set, radio loudspeaker, or radio telephone receiver, and includes any other article used for radio which the Minister has from time to time declared to be radio apparatus, provided that the Minister may at any time cancel any such declaration."

Station Ratings.—OFFICIAL STANDARD.—On the recommendation of its Technical Committee, the Council of the Union International de Radiophonie has adopted as the standard of expressing the power of broadcast radio-telephone transmitting plant that of the power, expressed in kilowatts, fed to the aerial when the carrier wave is unmodulated.

AMERICAN PLAN.—At the annual meeting of the Radio Division of the National Electrical Manufacturers' Association on June 6th at Chicago, it was announced that a sound plan for rating radio broadcasting stations on a merit basis would soon be released.

Transatlantic Photograms.

The wireless photogram service which has been conducted by the Marconi Company since May, 1926, for the transmission of photographs, drawings, signatures and facsimiles of all kinds by wireless between London and New York (see ELEC. REV., June 4th, 1926, p. 820) has been extended so that photograms received in New York by wireless may be transmitted by wire on to other important commercial centres in the United States of America. A photogram sent from London by wireless addressed to these cities is transferred in New York to the telephone-wire picture service of the American Telegraph & Telephone Company. The cities included in the service are Boston, Cleveland, Atlanta, Chicago, St. Louis, Los Angeles, and San Francisco. It is thus now possible for an illustration of the day's happenings and facsimiles for business or engineering purposes to be received in the cities mentioned within a few hours of their being handed in at Marconi House, London.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—August 14th. Postmaster-General's Department. Junction apparatus for manual exchanges. (B.X. 4486.)*

Electricity Commission of Victoria. August 6th. Neutral earthing compensator. (B.X. 4519.)*

October 31st. Water-tube boilers, with auxiliary and accessory equipment.

SYDNEY.—July 9th. Municipal Council. 33,000-V cable and 660-V pilot cable. (B.X. 4530.)

August 29th. N.S.W. Government Railways. Two 20,000-kW turbo-alternators and condenser plants for Ultimo power house.

September 12th. One 60-ton electric overhead travelling crane for Ultimo power station. Chief Electrical Engineer, 61, Hunter Street, Sydney.

Barnstaple.—July 13th. Corporation. One 100-kW Diesel oil engine with d.c. generator, one storage battery, 240 cells, l.p. switchgear, and about 14 miles l.p. cables. (June 22nd.)

Croydon.—July 3rd. Electrical Department. 18,000 tons of coal for chain-grate mechanical stokers. (June 22nd.)

Ecuador. — GUAYAQUIL. — July 31st. Government of Ecuador. One 5-ton (metric) and one 10-ton (metric) electrically-operated portal cranes. (A.X. 6387.)*

Edinburgh.—June 30th. Corporation. Installation of electric lighting at three housing schemes. Specifications from engineer's office, Dewar Place (deposit £1 1s.).

Harrogate.—July 17th. Electricity Department. Two 50,000-lb. boilers with pipework and accessories. (See this issue.)

India.—SIMLA.—July 2nd. India Stores Department. Equipment for the Sumera hydro-electric pumping and power supply scheme. (B.X. 4483.)*

July 3rd. 180 miles electric cable. (June 22nd.)

Irish Free State.—DUBLIN.—July 18th. Electricity Supply Board. Transformer stations, switchgear, and transformers. (June 22nd.)

London.—CENTRAL ELECTRICITY BOARD.—July 27th. South-East England electricity scheme. 33,000-V overhead transmission line between Brighton and Worthing. (See this issue.)

LONDON COUNTY COUNCIL.—July 9th. Scot extraction plant for the Greenwich power station. (June 15th.)

H.M. OFFICE OF WORKS.—July 6th. Supply of mechanical and electrical engineering labour in the Manchester district during a period of three years. (June 22nd.)

LONDON AND HOME COUNTIES JOINT ELECTRICITY AUTHORITY. —July 12th. Transmission lines from the Kingston-on-Thames B.C. generating station to the Hersham sub-station of the Walton-on-Thames U.D.C. (June 22nd.)

Llandilo.—July 14th. Urban District Council. One 75-kW crude-oil engine electric generating set; one 10-ton oil-storage tank, with pump, &c.; one control panel, with cable, &c. (See this issue.)

Manchester.—July 3rd. Electricity Committee. Twelve months' supply of 6,600-V cubicle-type sub-station switchgear. (June 22nd.)

New Mill.—July 11th (extended from June 29th). Urban District Council. Extension of overhead electricity supply mains. (June 22nd.)

Newport (Isle of Wight).—July 16th. Education Committee. Electric light installation at the Secondary School. S. R. Cocks, county surveyor, St. Thomas Street, Ryde.

Newry.—July 21st. Urban District Council. Two (approx.) 100-b.h.p. and one (approx.) 150-b.h.p. heavy-oil engines, each direct coupled to a l.p. 3-phase alternator; l.p. switchboard; one 5-ton overhead travelling crane; underground and overhead distributing mains and services and street-lighting installation. (See this issue.)

New Zealand.—WELLINGTON.—August 14th. Public Works Department. 50-kV switchgear and steelwork for Arapuni electric power scheme. (B.X. 4477.)*

Plymouth.—July 10th. Education Authority. Electric lighting installations at various schools. Specifications from the Town Clerk's office.

Preston.—July 2nd. Board of Guardians. Electric lift. Particulars from Mr. Stephenson, master, Poor Law Institution, Fulwood.

South Africa.—JOHANNESBURG.—July 26th. South African Railways and Harbours. Two 25-ton, six 10-ton, and two 2-ton electrically-driven overhead travelling cranes. (A.X. 6347.)*

August 2nd. Electrically-driven concrete mixing plant, self-propelling gantry, &c. (A.X. 6441.)*

July 12th. 120-kV transformers and truck-type switchgear. (B.X. 4479.)*

July 19th. Electric incandescent lamps. (B.X. 4487.)*

August 9th. Six electrically-driven overhead travelling cranes. (A.X. 6409.)* 50 kVA transformers and 2,100-V truck-type switchgear. (B.X. 4526.)*

KNYSNA.—July 6th. Municipal Council. Installation of an electric lighting and power system. (B.X. 4493.)*

CAPE TOWN.—July 25th. City Council. A.c. meters. (B.X. 4527.)*

UITENHAGE.—July 30th. Municipal Council. H.p. and l.p. switchgear, h.p. and l.p. cable, motors, fans, transformers, transformer kiosks, &c. (B.X. 4517.)*

BULAWAYO.—August 14th. Municipal Council. One water tube boiler with chain grate, one turbo-alternator, spray cooling equipment with circulating water piping, one 3-panel switchboard. (A.X. 6454.)*

Salford.—July 9th. Electricity Department. E.h.p. and l.p. paper-insulated lead-covered and armoured cables. Particulars from City Electrical Engineer, Frederick Road.

Stockton-on-Tees.—July 9th. Electricity Department. Paper-insulated cables. (See this issue.)

Shoeburyness. — July 16th. Electricity undertaking. Underground mains, switchgear, transformers and mains. (See this issue.)

Stone.—July 3rd. Urban District Council. E.h.p. and l.p. cable and l.p. overhead distribution and service lines. (June 15th.)

Swindon.—July 7th. Electricity Department. Steam, exhaust, water and other pipework, valves, tanks, evaporators, &c. (June 15th.)

Uruguay.—MONTEVIDEO.—August 10th. 20 equipments for transformer sub-stations, indoor type (6,600/220 V). (B.X. 4505.)*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Government Contracts.—The following contracts were placed by the various Government departments during May, 1928:—

ADMIRALTY CONTRACT AND PURCHASE DEPARTMENT.

Battery gear.—Tudor Accumulator Co., Ltd.
Cable clips.—Hawkers, Ltd.; J. Lawton & Sons, Ltd.; E. Showell & Sons, Ltd.
Cables.—British Insulated Cables, Ltd.; General Electric Co., Ltd.; W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.
Condenser boxes and condensers.—Park Royal Engineering Co., Ltd.
Electric light installation.—G. E. Taylor & Co., Ltd.
Electric lamps.—General Electric Co., Ltd.
Automatic feed regulators.—Contraflo Engineering Co., Ltd.
Resistances.—Electro-Mechanical Brake Co., Ltd.
Transformers.—Ferranti, Ltd.; Foster Engineering Co., Ltd.; W. H. Wilson.
W/T Valves.—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.
W/T Tuners.—Gambrell Bros., Ltd.; Plessey Co., Ltd.
Wireless fittings, metal.—Highton & Son, Ltd.; J. Stone and Co., Ltd.; Sir J. Laing & Sons, Ltd.; Mechans, Ltd.; Park Royal Engineering Co., Ltd.; W. McGeoch and Co., Ltd.

WAR OFFICE.

Batteries and cells.—Siemens Bros. & Co., Ltd.; India Rubber, Gutta Percha & Telegraph Works Co., Ltd.
Electric cable.—Callender's Cable & Construction Co., Ltd.; Johnson & Phillips, Ltd.
Aerial frames.—J. M. Dangerfield.

AIR MINISTRY.

Accumulators.—Hart Accumulator Co., Ltd.
Aerial reels.—Johnson & Phillips, Ltd.
Cable and boxes.—W. T. Glover & Co., Ltd.
Cable.—British Insulated Cables, Ltd.; General Electric Co., Ltd.
Wire cable.—Glaham & Robson, Ltd.
W/T valves.—A. C. Cossor, Ltd.

POST OFFICE.

Telegraph apparatus.—Standard Telephones & Cables, Ltd.
Telephone apparatus.—Ericsson Telephones, Ltd.; General Electric Co., Ltd.; Plessey Co., Ltd.; Revo Electric Co., Ltd.; Siemens Bros. & Co., Ltd.; Sterling Telephone & Electric Co., Ltd.; Telephone Manufacturing Co., Ltd.
Protective apparatus.—Phœnix Telephone & Electric Works, Ltd.
Battery stores.—General Electric Co., Ltd.
Cable.—British Insulated Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; Enfield Cable Works, Ltd.; General Electric Co., Ltd.; W. T. Glover & Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. and Co., Ltd.; Standard Telephones & Cables, Ltd.
Joint box castings.—Jones & Attwood, Ltd.; United Steel Cos., Ltd. (T. Butlin & Co.); J. Williamson & Co., Ltd.
Loading coils.—Standard Telephones & Cables, Ltd.
Ducts.—Albion Clay Co., Ltd.; Donington Sanitary Pipe and Fire Brick Co., Ltd.; Hepworth Iron Co., Ltd.; J. Oakes & Co. (Reddings Collieries, Ltd.); Oates and Green, Ltd.; Standard Brick & Terra Cotta Co., Ltd.
Electric hand lamps.—Ward & Goldstone, Ltd.
Electric lamps.—General Electric Co., Ltd.
Wood troughing.—Calders, Ltd.
Wallboards.—Venesta, Ltd.
Copper binding wire.—E. & E. Kaye, Ltd.
Soft copper wire.—Pirelli-General Cable Works, Ltd.
Tinned copper wire.—Enfield Cable Works, Ltd.
Flameproof wire.—Macintosh Cable Co., Ltd.; Reliance Electric Wire Co.
Manufacture, supply, drawing in and jointing cable.—Rochdale-Halifax (No. 2): British Insulated Cables, Ltd.
Telephone exchange equipment: Mumbles (Swansea multi-exchange area).—Siemens Bros. & Co., Ltd. Sub-contractors: Small Electric Motors, Ltd., for dynamotor. Deal: Siemens Bros. & Co., Ltd. Annfield (Liverpool); Castleton; Heywood; Littleborough; Milnrow; Norden; Shaw; Whitworth (Rochdale Multi-Exchange Area): Standard Telephones & Cables, Ltd. Wiggins Teape & Co., Ltd. (Dover): Relay Automatic Telephone Co., Ltd.

CROWN AGENTS FOR THE COLONIES.

Cable.—H. Wood & Co., Ltd.
Ducts.—Doulton & Co., Ltd.
Electric welding accessories.—Quasi-Arc Co., Ltd.
Fans.—Veritys, Ltd.
Static transformer.—Metropolitan-Vickers Electrical Co., Ltd.
Switchgear.—British Thomson-Houston Co., Ltd.
Telegraph ironwork.—Siemens Bros. & Co., Ltd.
Telephone apparatus.—Ericsson Telephones, Ltd.; General Electric Co., Ltd.
Transmission line materials.—Callender's Cable and Construction Co., Ltd.
Wire.—Elliott's Metal Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Rd. Johnson, Clapham and Morris, Ltd.; Shropshire Iron Co., Ltd.; F. Smith and Co.

Bradford.—Tramways Committee. Accepted:—
Electric lighting installation at new tramway headquarters offices, Forster Square (£430).—J. Carter.

Bexhill.—Electricity Committee. Recommended:—
Gasfilled lamps for 12 months.—General Electric Co., Ltd.
200 joint boxes.—William Lucy & Co., Ltd.

Brentford.—Accepted:—
Electrical installation at the new factory for the Firestone Tyre & Rubber Co., Ltd.—B. French (Kidderminster).

Brighton.—Electricity Committee. Accepted:—
E.h.p. switchgear for Southwick (£24,526).—Metropolitan-Vickers Electrical Co., Ltd.

Croydon.—Hospital Committee. Recommended:—
Electric lighting at Borough Hospital (£150).—E. J. Hayes.

Finchley.—Middlesex Education Committee. Recommended:—
Rewiring Finchley County School (£482).—J. B. Marr and Co., Ltd.

Glasgow.—Housing Committee. Recommended:—
Electrical installation at Westmuir Street rehousing scheme (36 houses) (£165).—A. Robertson.
Tramways Department.
V.i.r. cable.—Edison Swan Electric Co., Ltd.; Hackbridge Cable Co., Ltd.; and Craigpark Electric Cable Co., Ltd.
Armature binding wire.—Bruntons, Ltd.
Rotary convertors for sub-stations—One 500-kW.—Harland Engineering Co., Ltd.; two 1,000-kW.—Crompton-Parkinson, Ltd.
Trolley cord.—Belfast Roperie Co., Ltd.; Joseph Cookson, Ltd.; and Edinburgh Roperie & Sailcloth Co., Ltd.

Guildford.—Electricity Committee. Accepted:—
Cables and accessories for the extension of the transmission and distribution system to the outer areas:—

STANDARD TELEPHONES & CABLES, LTD. (Accepted.)	£22,733
W. T. Henley's Telegraph Works Co., Ltd. ...	23,119
Johnson & Phillips, Ltd.	23,198
Callender's Cable & Construction Co., Ltd. ...	23,402
British Insulated Cables, Ltd.	23,556
Enfield Cable Works	23,620

Hornsey.—Middlesex Education Committee. Recommended:—
Rewiring of Hornsey County School (£365).—J. B. Marr and Co., Ltd.

Isleworth.—Middlesex Education Committee. Recommended:—
Rewiring electric lighting installation at Spring Grove Secondary School (£358).—T. Clark & Co., Ltd.

Ipswich.—Electric Supply and Transport Committee.
Five single-decked trolley vehicles (£7,225).—Ransomes, Sims & Jefferies, Ltd. (Accepted.)

Lichfield.—City Council. Accepted:—
Mains extensions to Whittington (£3,929).—W. T. Henley's Telegraph Works Co., Ltd.

London.—METROPOLITAN ASYLUMS BOARD.—Accepted:—
Part contract for electrical accessories for 12 months.—Metro-Vick Supplies, Ltd.
IMPERIAL CHEMICAL INDUSTRIES.—Accepted:—
Electric clocks (400 dials).—Synchronome Co., Ltd.
BATTERSEA.—Libraries Committee. Accepted:—
Installation of synchronised clocks at Central Library.—Synchronome Co., Ltd.
FULHAM.—Electricity Committee. Recommended:—
1,500-kW Scott-connected transformer (£1,060).—Metropolitan-Vickers Electrical Co., Ltd.
STEPNEY.—Electricity Supply Committee.
54,000 ft. of steel conduit (£264).—Catchpole & Co.
ST. PANCRAS.—Contract and Stores Committee.
12,760 yd. l.p. cable:—

SIEMENS BROS. & CO., LTD. (Recommended.)	£1,895
Standard Telephones & Cables, Ltd.	1,924
Hackbridge Cable Co., Ltd.	1,949
Pirelli-General Cable Works, Ltd.	1,951
British Insulated Cables, Ltd.	1,959
Greenwich Cable Works, Ltd.	2,050

South Africa.—JOHANNESBURG.—Tramways and Lighting Committee. Recommended:—
Two 10,000-kW steam turbo-generator sets (£45,530).—British General Electric Co., Ltd.
Four water-tube boilers, stokers, &c. (£79,935).—Reunert and Lenz.
—*S.A. Mining and Engineering Journal.*

Southend-on-Sea.—Town Council. Accepted:—
350 yd. of .1 sq. in. and 460 yd. of .6 sq. in. cable for the rotaries in connection with the linking-up scheme (£578).—Pirelli-General Cable Works, Ltd.

Stockton-on-Tees.—BILLINGHAM.—Synthetic Ammonia and Nitrates, Ltd.
Forty-two 1,500-kVA transformers and a number of smaller ones.—British Electric Transformer Co., Ltd.

Tiverton.—Town Council. Accepted:—
Installation of electric light at the Town Hall (£103).—Stenner & Gunn.

Uxbridge.—Middlesex Education Committee. Recommended:—
Installation of electric lighting at Uxbridge County School and Whitehall Council School (£274 and £186).—G. A. Weston.

Forthcoming Events.

Institution of Electrical Engineers.—Thursday, July 5th. Natural History Museum, South Kensington, S.W. Conversazione. 8.30 to 11 p.m.
(South-Midland Centre).—Tuesday, July 10th. Summer meeting. Visit to Bakewell, Haddon Hall, and Matlock.

Physical Society.—Saturday, July 7th. Visit to Bristol.

Electrical Contractors' Association.—July 4th-6th. Cheltenham. Annual conference.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, July 7th. 4 p.m. Visit to the generating station of the South Wales Electrical Power Distribution Co. at Upper Boat.

Royal Agricultural Show.—Wednesday, July 11th. Nottingham. 12 noon. Conference: "Some Suggestions on how Electricity Can Help the Farmer." Mr. W. Rigg.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

COLUMBUS boiling ring, No. 300.
SANDING MACHINE for levelling composition floors, &c.
SANOTHERM bed warmers.

Notes.

Sydney Bribery Charges.

The *Daily Telegraph* reports that the Royal Commission which has been investigating the charges of bribery against Mr. S. Y. Maling, deputy general manager of the Sydney Electricity Department, and former Labour members of the Sydney City Council, in connection with a contract for power plant, has published its report. The Commission finds that both Mr. A. J. Arnot, the Australian manager for Babcock and Wilcox, Ltd., and Mr. Hutchison, general manager of International Combustion, Ltd., promised payment of large sums of money, but that International Combustion, Ltd., was not privy to Mr. Hutchison's offer, and there was no evidence that money had been forwarded to Sydney. How the money received from Babcock & Wilcox, Ltd., was distributed remains doubtful. Our contemporary goes on to state that the fact that the pressure came from Maling does not lessen the culpability of Mr. Arnot, who, in common with other persons dealing with the Council, was evidently convinced that the contracts of the Council could only be secured by payments to members of the Council. That this was so shows a lamentable state of affairs, but rumours of this kind have been rife for many years, and not only when Labour had a majority on the Council. The late Sir James Kemnal, managing director of the company when the £10,000 was dispatched, knew that the money was wanted for an improper purpose. There is no reason to suppose that any portion of the money was received by Arnot. No harm was done to the interests of the citizens by the corrupt bargain of Arnot and Maling. The price was fixed before any question of the payment of "graft" money was contemplated. The Babcock & Wilcox tender would have been accepted if no promise of money had been given. Mr. Justice Harvey expresses the view that the offer made by Mr. Hutchison, of £15,000, was a large element in causing Mr. Arnot's offer of £10,000. Mr. Hutchison asked the company for £15,000 for "preliminary expenses." When asked what preliminary expenses meant, he replied that the company ought, with its knowledge of how things were done, to understand what it meant. There was no evidence that the company sent the money or was privy to Hutchison's action. Hutchison was subsequently recalled. Mr. Justice Harvey, while not placing credence in Mr. Maling's uncorroborated evidence, does not accept Alderman Green's denial that he had received money from Maling. Mr. Green admitted in evidence that for years he had deliberately defrauded the income-tax, and therefore was not a person of so unblemished a character that a "graft" transaction was the last thing with which he was likely to be associated. The story that Mrs. Green kept £1,500 under the floor of their house for a year was the acme of improbability. It was significant that the Greens invested in property after the acceptance of the tender. Mr. Justice Harvey also accepted Arnot's evidence that he was approached by Holdsworth for £1,000 as his share to support the tender. The Government is now considering criminal proceedings arising out of the report.

It is reported that Mr. Maling has been dismissed from the service of the Sydney Electricity Department by the Civic Commissioners, who at the same time have asked him to pay over to the Council the sum of £10,600.

Royal Air Force Pageant.

The speech-amplifying equipment to be used at the Hendon aerodrome to-morrow for the Royal Air Force Flying Display will, as on previous occasions, be installed by the Marconiphone Company. This year sees yet another increase in the size and scope of the apparatus, 40 powerful loud-speakers being used. Microphones will be employed for announcements, descriptions of the events, and for relaying the band music. To provide adequate volume special amplifier panels have been constructed, and over 120 super-power valves will be used, 96 of them forming the last stage alone. Over one kilowatt of power will be delivered to the loud-speaker circuits by the equipment, distributed through ten miles of wiring specially buried below the surface of the ground. The total weight of the equipment, excluding wiring, exceeds five tons.

Appointments Vacant.

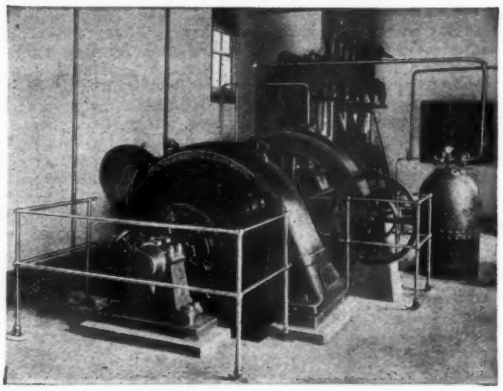
Plumber-jointer for the Cheadle and Gatley U.D.C. Electricity Department. Fireman-electrician (70s.) for the Richmond Corporation Fire Brigade Committee. Meter superintendent (£500) for the Perak River Hydro-Electric Power Co., Ltd. Fitter and turner for the Netherne Mental Hospital, Coulsdon. Supervising electrical engineer for Messrs. Gent, Hurley & Orringe, Leicester. Charge shift engineer (£361) for the London County Council tramways department. Assistant in meter department for the West Gloucestershire Power Co., Ltd. (£150). (See our advertisement pages to-day.)

The British Industries Fair.

The Department of Overseas Trade states that owing to the success of the last Fair (which was a record for space let, the number of exhibitors and the number of overseas buyers), it has been found necessary to provide an extra hall giving 100,000 sq. ft. of stand space in addition to the 250,000 sq. ft. occupied by the London section of the last Fair—roughly a 40 per cent. increase. Provisional applications for space at White City amount to two-thirds of the total new stand area. In Birmingham the increase of space will bring the exhibition area to about 250 000 sq. ft., making a total area for both sections of the Fair of over 600,000 sq. ft. Public interest at the White City was so great this year that it has been decided to open the next Fair to the public at four o'clock instead of five each evening.

Electrical Enterprise in the Highlands.

One of the earliest electricity supply undertakings in the Highlands of Scotland is that at the Burgh of Grantown-on-Spey, where the enterprise of a local contractor, Mr. George Anderson, was instrumental in the installation in 1900 of a generating set and battery for supplying light and power to his own premises and a few local shops. As the result of expert advice upon the future lighting of the town, the Town Council in 1927 entered into an agreement with Mr. Anderson,



Generating Plant at Grantown-on-Spey.

one condition of which was that the generating plant should be extended to meet the growing demands. A new battery has recently been installed by the Chloride Electrical Storage Co., Ltd., and a new generating set was ordered from the General Electric Co., Ltd. The set consists of a 3-cylinder Ruston and Hornsby vertical crude-oil engine directly coupled to a 96-kW G.E.C. generator. Grantown-on-Spey has approximately 1,669 inhabitants, the consumers at present connected numbering approximately 200. With the new plant installed and with the extensions to the distributing system, it is anticipated that this number will be considerably augmented in the near future.

Association of Public Lighting Engineers.

At the Public Lighting Conference to be held at Sheffield during the second week in July trial street lighting will be carried out by the president-designate (Mr. J. F. Colquhoun, lighting engineer for the City of Sheffield) to demonstrate in a practical form the much-discussed, and not over-well understood, "Standard Specification for Street Lighting" prepared by the British Engineering Standards Association last year, which was the subject of an important paper at the meeting of the Association at Brighton.

We are informed by Captain Liberty (secretary of the Association) that no less than eight miles of streets will be experimentally lighted and will be inspected at night not only by the members and delegates during their stay in the city, but also on other nights by various scientific bodies interested in the question. At midnight motor transport will be provided to convey representatives over the route. The British Engineering Standards Association is holding a plenary meeting of the Street Lighting Section No. 39/5 at the Association's headquarters at 11 p.m. at the Grand Hotel on the Thursday, after which conveyances will be provided to take the members out to view the demonstration; and the officials of the National Physical Laboratory have arranged for an all-night test, in conjunction with the members of the Lighting Association,

with the view of getting accurate results on the spot and data for use after the conference to enable them to draw conclusions from the demonstration.

The whole of this work is the result of a wish expressed at the Brighton Conference last year that the information contained in the Specification should be put to a practical test. To enable this to be done, a large number of public lighting firms have rendered assistance by the loan of various lighting appliances, whilst the Corporation of the City of Sheffield, through its Watching, as well as its Lighting Committee, is sparing no effort or expense in assisting to make the demonstration a success. Further information can be obtained from the secretary, Captain W. J. Liberty, at the offices of the Association, 68, Victoria Street, S.W.1.

The B.I. Convalescent Home.

On Tuesday last week Mr. D. Sinclair, chairman and managing director of British Insulated Cables, Ltd., opened the new convalescent home which the company has acquired for the use of its employés. The building is Upper Downing Hall, Whitford, near Holywell, and it stands in 21 acres of land. The convalescent home was referred to at the annual meeting of the company in March by the chairman, who said that the directors had resolved to provide it without charge for interest and sinking fund so long as the employés subscribed to maintain it. The building itself and a part of its pleasant surroundings are illustrated herewith.

The B.I. Convalescent Home.

Part of the Upper Downing Hall Grounds.

Boiler House Efficiency and Economy.

An enormous amount of research, theorising and experiment had been carried out during the last 50 years in connection with the furnace side of the steam boiler, almost uselessly, said Mr. T. Roland Wollaston, M.I.Mech.E., at the summer meeting of the Institution of Heating and Ventilating Engineers at Blackpool, in that the investigators had nearly always started from unsound bases, to wit, the orthodox flat-grate thin-fire furnace and the assumption that "convection" played the most important part in transferring heat from the fuel to the water. In burning coal on such grates they were told that the utilisation of 50 per cent. excess air with, say, 12 per cent. CO_2 in the resultant chimney gas, constituted excellent practice; then, again, it had been the custom to rate boilers on "heating surface," regardless of its location in relation to the fire; nothing could be more absurd. One constantly heard of guarantees of from 5 to 8 lb. evaporation per sq. ft. of heating surface per hour from boilers, but it was obvious that the rate of evaporation from the surface nearest the fire must be many times that from the surface furthest away. Mr. Wollaston looked forward to the tubeless (and obviously cheaper) boiler in which, by converting all the heat possible into radiant heat, evaporation of the order of 30 to 50 lb. per sq. ft. of heating surface per hour would be suggested, be obtained by adopting gas-producer practice in the design of a producer boiler. He further illustrated the evolution of the radiant-heat boiler with the object of attracting interest to induce some of the members to think with him on lines which he felt satisfied would greatly improve and cheapen steam-raising plant in the future.

E.D.A. Visit to Electrolux Works.

On June 20th the chairman and members of the B.E.D.A. Refrigeration Sub-Committee and their friends paid a visit to the refrigerator works of Electrolux, Ltd., Luton. The inspection of the works was preceded by a luncheon at which the executive manager of the company (Mr. J. G. A. Berg) presided and addressed the visitors on refrigeration matters. Mr. T. Hall, the chairman of the Sub-Committee, Mr. J. Raymond, hon. secretary of the British Association of Refrigeration, and Lt.-Col. W. A. Vignoles, director and secretary of the B.E.D.A., also spoke.

Power Station Explosion.

The *Sussex Daily News* reports that an explosion occurred in the exhaust pit at East Grinstead Urban District Council's electricity works on June 25th. The local fire brigade was called and quickly extinguished the conflagration. The whole of the concrete flooring was blown away and the ceiling and walls were damaged. The explosion did not affect the generating plant, and there was no interruption in the electricity supply.

An Oil-Electric Locomotive.

The first light-weight oil-electric "switcher" locomotive built in America has been shipped from the East Pittsburgh works of the Westinghouse Electric & Manufacturing Company to New York, where it will be put in service on the Long Island railroad. It is capable of exerting 600 h.p., weighs only 85 tons, and burns the very cheapest grades of fuel oil; what a steam engine will do on a ton of coal the new engine will do on 10 gallons of oil. It operates at 800 r.p.m. maximum, while the next highest speed American-built oil engine now in service operates at 500 r.p.m., and all others operate at lower speeds. Its weight per b.h.p. is 23.5 lb., while the next lightest American-built engine weighs more than 40 lb. per b.h.p. The locomotive will be used by the Long Island railroad for switching purposes, making it unnecessary to operate steam engines over sidings which are not equipped with an electric third rail or trolley wire. It consists of two cabs normally coupled together and operated as a single unit, but capable of individual service if desired. The combined unit is 47 ft. long, and is geared for a maximum speed of 34 miles per hour. Each cab contains a 300-h.p., 6-cylinder oil engine, and each engine drives a 210-kW, d.c., 750-volt generator, which furnishes electric power for two traction motors, starts the oil engine, receiving 64-volt power from a storage battery, and charges the battery while idling. "Automatic torque-governor control" permits all the power developed by the engine to be applied at all times, even when starting or pulling heavy loads at low speeds. The engine's mechanical parts were supplied by the Baldwin Locomotive Co.

A Flying Visit.

Mr. W. C. P. Tapper, borough electrical engineer and manager of Stepney Electricity Undertaking, and a past-president of the I.M.E.A., holds the distinction of being the first member to visit the Convention town by air.

Mr. Tapper, who for business reasons was unable to attend the Convention during the whole of the week, flew down on Friday, June 15th, from London in a "Moth" aeroplane, leaving Stag Lane Aerodrome first thing in the morning and arriving at Bath in time for the annual general meeting of the Association, which he attended. He returned to London by air later in the day. The illustration on p. 1151 shows Mr. Tapper alighting from the machine in a landing field on the outskirts of the town.

Electricity at the Aylesbury Civic Week.

Next week Aylesbury will be *en fête*; a Trade and Industrial Exhibition will be opened by Lord Burnham to-morrow (Saturday), and will be visited by the Duke of York on Monday. The Electricity Department will take an active part in the week's doings; the uses of electricity will be very much in evidence at the Exhibition, in connection with the home, with agriculture, and with small industries. An inquiry office will be open at which the electrical engineer (Mr. W. A. Turnbull) and his staff will be in constant attendance, and practical demonstrations will be given; a six-roomed model electric house will be on view, as well as a free kinematograph and numerous side shows. Tuesday, July 3rd, will be "Women's Day"; the Electrical Association for Women will meet, and will be addressed by Councillor Mrs. Hammer, late chairman of the Hackney Electricity Committee, at 4.30 p.m. All ladies are invited to the conference. Wednesday will be the "Agricultural Day," and Mr. Francis, of the British Electrical Development Association, will lecture on "Electricity and Agriculture," with the aid of the kinematograph. On Friday the Overhead Lines Association and kindred engineering societies will hold a conference, and the film which aroused so much interest at the joint meeting of the American and British Institutions of Electrical Engineers last February—"Voices Across the Atlantic"—will be shown; this alone would make a visit to Aylesbury worth while. Engineers of all persuasions are invited to attend the Friday meeting, and will find much to interest them—as well as a cordial welcome from Mr. Turnbull.

Manchester Municipal College of Technology.

The prospectus giving particulars of the courses in mechanical, electrical, and municipal and sanitary engineering, applied chemistry, textile technology, and industrial administration can be obtained free on application to the Registrar. (See our advertisement pages to-day.)

The Batti-Wallahs.

Maj.-Gen. Sir Philip A. M. Nash, K.C.M.G., C.B., will address the Batti-Wallahs' Society after luncheon at the Hotel Cecil on Wednesday, July 11th, at 1 p.m.

E.A.W. Activities.

On June 12th members of the Birmingham and Midlands branch of the Electrical Association for Women visited the Lightfoot refrigeration works in Digbeth and Cheapside. In the latter works members visited "chilling" rooms always kept at 36 deg. to 37 deg. F. They saw a refrigerator under test for India and were interested to learn that machinery for ice-making in the tropics, was tested in rooms at a temperature of 120 deg. F.

On June 16th members of the Leeds and West Riding branch of the Association paid a visit to the all-electric farm of Mr. Percy Hudson, at Carelton, near Skipton, where they witnessed a demonstration in the use of electricity in producing Grade A milk.

Institution Notes.

Institution of Electrical Engineers.

NORTH-WESTERN CENTRE.—As a result of the nominations and ballot taken at the annual general meeting of the Centre held at Manchester on April 3rd, the following officers and new committee members were elected for the session 1928-29: Chairman, Mr. J. Harcourt Williams; vice-chairmen, Messrs. T. E. Herbert and A. L. Lunn; hon. secretary, Mr. J. D. Peattie; hon. treasurer of the benevolent fund, Mr. A. S. Barnard; new members of committee, Messrs. T. Baxendale, T. A. Kerr and G. F. Sills. At April, 1928, there was a total membership of 1,087 for the Centre, a decrease of 16 from the figure for the previous year.

Institute of Physics.

A lecture has been arranged, with the co-operation of the Seventh International Congress of Photography, on "Physics in Photography," by Mr. C. E. Kenneth Mees, D.Sc., director of the Research Laboratory, Eastman Kodak Co., Rochester, N.Y. The lecture will be given on Thursday, July 12th, at 8 p.m., at the Institution of Electrical Engineers, London. The chair will be taken by Sir William Pope, K.B.E., LL.D., F.R.S., President of the Congress.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. WILLIAM CHAMBERLAIN, tramways and transport general manager and chief engineer at Leeds, who is recommended for the Belfast appointment, is a native of Lancaster. After a time in the workshops of the Lancaster Rail Carriage and Wagon Co. he became an apprentice in the Lancaster Corporation Electricity Department, and pursued his studies at the Storey Institute Technical School. Three years later he became a shift engineer at Wallasey U.D.C. electricity works, and after another three years he was appointed an electrician with the Mersey Docks and Harbour Board which six months later, made him assistant electrician on the whole of the Mersey Docks Estate. He became mains superintendent and distributing engineer to the Oldham Corporation Electricity Department in 1902, and several years later was appointed joint borough electrical engineer and manager. In 1918 he was asked to undertake the duties of general manager and engineer of the tramway system, and as a result this department was brought into the same sound financial position as the electricity works. In 1925 Mr. Chamberlain was appointed general manager and chief engineer to the Leeds Tramways. He is vice-president of the Municipal Tramways and Transport Association (Inc.), and is expected to become president in September next. He has been a member of the Executive Council for about six years, and during the passage of the Railway (Road Transport) Bills through the Joint Committee stage in the Houses of Parliament he has acted as chief witness for 51 petitioning authorities in support of their opposition.

J. Bacon & Sons.]

Mr. W. Chamberlain,
Who has been recommended for the Belfast tramway managership.

The Glasgow Corporation discussed at last week's meeting both the question of Mr. R. B. MITCHELL'S superannuation allowance and the appointment of his successor as general manager of the Electricity Department. By 49 votes to 19 it was agreed that Mr. Mitchell's pension should be £764 per annum. Mr. HERBERT BELL, city electrical engineer of Hull, was appointed manager of the Department at a minimum salary of £1,500 per annum on a vote of 47 votes to 31. The opposition, it is stated, favoured a motion by Bailie Higgins, the convener of the Electricity Committee, who wanted the matter referred back so that Mr. G. MORGAN, the present assistant engineer, who has been in the service of the Corporation for twenty years, should be heard. Mr. Bell's appointment was moved by the sub-convener, Mr. Holmes.

In the course of the discussion one speaker said that Mr. Morgan was an excellent man, but the principal qualification for the general managership of the Department was not a technical one; it was administrative and commercial ability. We presume that the discussion of the technical and managerial control of the undertaking may now be regarded as at an end. Whatever indication there may appear to be to the contrary in the actual voting figures, we hope that the Committee and the Corporation as a body will settle their differences and at the earliest possible moment combine, under the new manager, in the continuance of a policy which shall encourage the use of electricity for all purposes. The recent unfortunately drawn-out controversy may well lead observers of municipal activity to ask: "Stands Glasgow where it did?" In wishing Mr. Mitchell a speedy recovery of health and strength, we may also express the hope that the Corporation having now appointed a new manager, will not only give him an opportunity of carrying out a progressive policy, but will look also to its past errors and so organise itself that they shall not be repeated and operate to the detriment of the new chief.

Mr. Bell, M.I.E.E., O.B.E., T.D., is 50 years of age, and he has been general manager at Hull, exclusive of the war period, for 20 years. Not only has he been entirely responsible for the development of the undertaking on both its commercial and engineering sides, but he has had wide experience of the electrical aspect of dock and railway development. The complete electrification of the King George Dock of the London and North-Eastern Railway Co. was carried out by him in

conjunction with the dock engineer of that period. The electrical requirements of heavy industries have also come within his scope, and he has had experience of contemporary electrical practice in other countries, especially in Canada and the United States. Mr. Bell holds the rank of Major (retired) in the Royal Engineers, and for his service he was awarded the Territorial Decoration.

Mr. W. JENSEN is retiring from the position of general manager of the Chatham and District Light Railways Co., which he has held since the company's inception. At a recent meeting of the employés Mr. Jensen was presented with an illuminated address and radio apparatus by Mr. A. J. BOUSFIELD, the assistant general manager, who is succeeding him.

Messrs. R. L. QUERTIER, B.Sc., A.M.Inst.C.E., and KINGSLEY REAVELL, A.M.I.Mech.E., have been added to the board of Messrs. Reavell & Co., Ltd. Mr. R. L. Quertier has been manager of the London offices of the company for many years, and Mr. Kingsley Reavell is the son of the managing director, Mr. William Reavell, M.I.N.A., P.P.I.Mech.E.

Mr. ROBERT O. CLARK, F.C.R.A., has resigned his position as secretary to Power Contracts, Ltd., and various other companies on appointment as secretary to the Amalgamated Fruiterers, Ltd., of which Sir Herbert Morgan, K.B.E. (Cosmos Lamp Works, Ltd., &c.), is chairman. Mr. Clark has specialised in the standardisation of electrical contractors' costs.

The London County Council Highways Committee recommends that Mr. T. W. HUDSON, charge shift engineer, be promoted to the position of combustion engineer in the electrical branch of the tramways department at a salary of £315 (based on pre-war conditions). The total remuneration, with temporary additions, at the present time is £442.

The Croydon Corporation Tramways Committee reports that Mr. T. B. GOODYER, the tramway manager, is desirous of being relieved of his present duties. Mr. Goodyer has been in the service of the Corporation for 22 years, having previously been in the service of the company which leased the undertaking prior to its being taken over by the Corporation in 1906. He is now 62 years of age. The Committee recommends that his services be retained in a consulting capacity at a salary of £500 per annum. It is also recommended that Mr. G. V. STANLEY, the present engineering assistant, be appointed acting manager at £550 per annum, being an increase of £50 on his present salary.

Mr. J. A. FORDE, M.I.E.E., general manager of the Isle of Thanet Electric Tramways and Lighting Co., Ltd., who is the chairman of the Broadstairs and St. Peter's Urban Council, was on June 18th sworn in as a magistrate for Kent.

We are informed that Mr. P. T. BOUND, of Barton, Canada, who is connected with the Hydro Commission, will be returning to this country early in July on two months' leave of absence, after 19 years' electrical service in Ontario. He will reside at Aigburth, Liverpool.

Obituary.—MR. A. A. PARSONS.—We deeply regret to record the death of Mr. Arthur Augustus Parsons, another radiographer who has sacrificed himself as a martyr to X-ray science. At an inquest held last week it was stated that he was a pioneer of such work in London, and had suffered amputations in consequence. He was for 20 years radiographer at the Seamen's Hospital, Greenwich, and for six years previously at the Westminster Hospital. Death was stated to be due to carcinoma contracted directly in consequence of his work, and a verdict of "Accidental Death" was returned.

MR. T. HOLLAND.—The death has occurred at the age of 35 years of Mr. Thomas Holland, who was on the staff of the Metropolitan-Vickers Electrical Co., Ltd., of Sheffield.

MR. E. K. WAITE.—The death occurred on June 16th, at the age of 39 years, of Mr. Edward Kenneth Waite, of the Western Union Telegraph Co.

Chief Electrical Engineer CARTER, of H.M.S. *Diomede*, was taken ill while the vessel was proceeding to Portsmouth for refit after a two and a half years' cruise in New Zealand waters, and died in hospital at Bilbao on Thursday, June 21st. Deceased, who was 38 years of age, served in the line under Admiral Beatty during the war.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Campbell & Addison, Ltd.—Private company. Registered June 20th. Capital, £30,000 in £1 shares (15,000 10 per cent. preference and 15,000 ordinary). Objects: To acquire the business of wireless telegraphy and telephony, and electric light, heat and power suppliers and engineers, carried on by Campbell Farrar and Chas. A. McKeand at 40, Howland Street, Tottenham Court Road, W.1, together with certain patents and trade marks. The directors are: Campbell Farrar, 40, Howland Street, W.1 (chairman); Chas. A. McKeand, 40, Howland Street, W.1; Wm. H. Sayers, 132, Regent Street, W.1; Geo. Farrar, 40, Howland Street, W.1. The Electramonic Co., Ltd., may, while holding by itself or its nominees 500 preference shares, appoint one director. W. H. Sayers is so appointed. Campbell Farrar may, while he or his nominees hold 500 ordinary shares, appoint one director. G. Farrar is so appointed. Qualification, £100. Solicitors: Farrar Porter and Co., 2, Wardrobe Place, E.C.4.

Cuthbertson & Co., Ltd.—Private company. Registered in Edinburgh June 21st. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, &c. The first directors are: R. T. Cuthbertson, 150, Raeberry Street, Glasgow, and W. M. Howitt, 16, Camden Street, Glasgow, C.5, wireless factors; J. Lawrie, "Ochilview," Camelon, Falkirk, coachbuilder. Registered office: 217, West George Street, Glasgow, C.2.

"M.P.A." Wireless, Ltd.—Public company. Registered June 20th. Capital, £100,000 in 140,000 10 per cent. non-cumulative preferred ordinary shares of 10s. each and 600,000 deferred shares of 1s. each. Objects: To acquire from the Motorists' Purchasing Association, the business of manufacturers of and dealers in wireless apparatus and appliances, to adopt an agreement with M.P.A., Ltd., as agents for the said company, and to carry on the said business and that of manufacturers of and dealers in electrical, telegraphic, photographic and scientific apparatus, appliances, equipment and accessories, &c. The first directors are: A. E. Hodgson, 33, Adelaide Crescent, Hove; R. I. Denham, 7, Wildwood Road, Hampstead Heath, N.W.11; J. H. R. Webber, 16, Canvey Road, Marine Parade, Leigh-on-Sea; J. F. Shaw, 18, Southway, Golders Green, N.W., all company directors. Secretary: E. H. Dock Registered office: 62, Conduit Street, W.1.

Samdon Wireless Co., Ltd.—Private company. Registered June 21st. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of and dealers in all kinds of electrical and other instruments, appliances, materials, and components in connection with wireless telegraphy, &c. The directors are: S. Kremner, 27, Princess Road, Sale, Cheshire; D. McGregor, "Alpine," Davyhulme, Urmston. Registered office: 41, John Dalton Street, Manchester.

Adamson, Green & Co., Ltd.—Private company. Registered June 18th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical, mechanical, and general engineers, manufacturers of and dealers in electrical switchgear, motors, dynamos, insulation materials, plant, &c. The first directors are:—J. G. Adamson, 9, Carlton Terrace, Low Fell, Co. Durham, electrical engineer; N. P. Green, Westville, North Gosforth, draughtsman; J. G. Graham, Hillcroft, Stocksfield, electrical engineer (all permanent). Qualification: 100 ordinary shares.

A. L. M. Engineering Co., Ltd.—Private company. Registered June 15th. Capital, £1,000 in £1 shares. Objects: To promote the interests of Rowe Bros. & Co. (Bootle), Ltd., to carry on business as mechanical and electrical engineers, metal workers, machinists, smiths, woodworkers and builders, &c. The subscribers (each with one share) are:—W. J. Hill and R. Smith, 2, Bond Court, Walbrook, E.C.4, clerks. The first directors are to be appointed by the subscribers. Registered office: Hawthorne Road, Bootle, Lancs.

Baird International Television, Ltd.—Public company. Registered June 21st. Capital, £700,000 in 5s. shares (1,400,000 "A" and 1,400,000 "B"). The holders of the "A" shares are entitled to a fixed cumulative preferential dividend of 10 per cent. per annum and take 40 per cent. of any balance of profits remaining available for distribution. In a winding up,

the "A" shares rank first for repayment of capital, and take 40 per cent. of any surplus assets remaining after repayment of the "B" capital. Objects: To test, exploit, exercise, develop, manufacture, improve, exhibit, work, let out on hire and generally turn to account and trade with inventions relating to "a system of transmitting views, portraits and scenes by telegraphy or wireless telegraphy," and to adopt two agreements with Television, Ltd. The subscribers (each with one share) are: C. G. Cave, 21, Cholmondeley Avenue, Harlesden, N.W.10, clerk; A. W. Slade, 73, Nichols Square, Hackney Road, E.2, clerk, and five others. The first directors are to be appointed by the subscribers. Qualification: £250 shares. Remuneration: £350 each per annum (chairman £500) and a percentage of the profits. Registered office: 133, Long Acre, W.C.2.

Electric Development and Securities Trust, Ltd.—Public company. Registered June 18th. Capital, £10,000 in £1 shares. Objects: To acquire and hold shares, stocks, debentures, debenture stock, bonds, obligations and securities of any company, carrying on business in Great Britain or elsewhere, in particular by any company concerned in the generation, accumulation, distribution or employment of electricity or gas or manufacturing or dealing in appliances for use in connection therewith, &c. The minimum cash subscription is seven shares. The subscribers (each with one share) are:—F. J. W. Gurnery and six other solicitors, of 18, Austin Friars, E.C. The first directors are to be appointed by the subscribers. Qualification, £250. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Quadruple Valve Co., Ltd.—Private company. Registered June 16th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless valves, sets and apparatus, &c. The subscribers (each with one share) are:—E. Richardson, Doddington Road, Earls Barton, Northampton, brick manufacturer; J. Parker, 23, King Street, E.C.2, chartered secretary. The first directors are not named. Secretary (*pro tem.*): J. Parker.

Pearson Glass Machines, Ltd.—Private company. Registered June 11th. Capital, £3,500 in £1 shares. Objects: To carry on the business of manufacturers and repairers of automatic glass machinery and all accessories, motor, electrical, &c., engineers, machinists, metal workers, electricians, &c. The subscribers (each with one ordinary share) are: N. Shaw, Market Place, Dewsbury, C.A.; R. A. Lang, Fairmount Terrace, Earlsheaton, Dewsbury, accountant's clerk. The first directors are to be appointed by the subscribers. Qualification: 100 shares. Solicitors: J. A. Stapleton & Son, 24, Union Street, Dewsbury.

Allite, Ltd.—Private company. Registered June 22nd. Capital, £300 in £1 shares. Objects: To carry on the business of importers and exporters of and dealers in electrical goods, wireless instruments and accessories, cycles, cycle accessories, &c. The directors are:—A. Brodersen, 17, Winifred Road, S.W.19, merchant; T. D. Willcock, 56, Stapleton Hall Road, Stroud Green, N.4. Manager: A. Brodersen. Registered office: 94, Clerkenwell Road, E.C.1

Arthur Bailhache, Ltd.—Private company. Registered June 21st. Capital, £2,500 in 10,000 ordinary shares of 1s. each and 2,000 10 per cent. participating preference shares of £1 each. Objects: To carry on the business of electrical engineers, manufacturers and general factors of electrical goods, motor accessories, foot pumps, advertising signs, vacuum cleaners and refrigerators, merchants, warehousemen, importers, exporters, &c. The directors are:—C. H. Bailhache, 1, Anglefield Road, Berkhamsted, Herts., merchant (permanent); E. J. Arthur, Utterstone, Maze Green Road, Bishops Stortford, Herts., merchant. Registered office: 120 and 122, Victoria Street, S.W.1.

Hepplewhite (Parkgate), Ltd.—Private company. Registered June 22nd. Capital, £500 in £1 shares. Objects: To carry on the business of electrical, radio and mechanical, civil, marine, railway, tramway, constructional, metallurgical, hydraulic, sanitary, general consulting and testing engineers, suppliers of light, heat, sound and power, ironfounders, &c. The permanent directors are:—H. Allt, 17, Rawmarsh Hill, Rotherham; E. Hepplewhite, Parkgate, Rotherham. Secretary: Lois Wyatt. Registered office: 24, Goosebutt Street, Parkgate, Rotherham.

Official Returns of Electrical Companies.

F. Parks, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated June 1st, 1928, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

Hall's Longitudinal Lighting Co., Ltd.—Mortgage debenture dated June 8th, 1928, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: T. G. Simpson, 5, Victoria Street, S.W.1.

Universal Sheet Metal Works, Ltd.—A. H. Barbour, of 114a, Blackstock Road, N.4, was appointed receiver and manager on June 11th, under powers contained in debenture dated March 31st, 1928.

Christie & Hodgson, Ltd.—Issue on March 27th, 1928, of £150 debentures, part of a series already registered. (Notice filed June 13th.)

Artic Fuse and Electrical Manufacturing Co., Ltd.—Mortgage on land and buildings at Elizabethville, Birtley, Durham, dated June 7th, 1928, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

Royce, Ltd.—Debenture dated June 7th, 1928, to secure £5,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: F. H. Royce, Elmstead, West Wittering, near Chichester.

Rudolph Charles & Goff, Ltd.—F. Hyde, C.A., of 34, London Wall, E.C.2, was appointed receiver on June 5th, 1928, under powers contained in debenture dated March 29th, 1924.

British Hanovia Quartz Lamp Co., Ltd.—Capital, £25,000 in £1 shares. Return dated April 28th, 1928. All shares taken up. £20,500 paid. £4,500 considered as paid. Mortgages and charges nil.

J. F. Smith (Birmingham), Ltd.—Capital, £3,000 in £1 shares. Return dated December 31st, 1927 (filed March 7th, 1928). All shares taken up. £3,000 paid. Mortgages and charges nil.

Paignton Electric Light and Power Co., Ltd.—Capital, £40,000 in £1 shares. Return dated March 28th, 1928. All shares taken up. £40,000 paid. Mortgages and charges nil.

Ericsson Telephones, Ltd.—Capital, £500,000 in 199,970 preference and 300,030 ordinary shares of £1 each. Return dated April 10th, 1928. All shares taken up. £269,980 paid (being £1 per share on 50,010 ordinary and 199,970 preference and 8s. per share on 50,000 ordinary). £230,020 considered as paid (being £1 per share on 200,020 ordinary and 12s. per share on 50,000 ordinary). Mortgages and charges, £100,000.

A. Reyrolle & Co., Ltd.—Capital, £500,000 in 40,000 preference and 460,000 ordinary shares of £1 each. Return dated April 18th, 1928. 40,000 preference and 360,000 ordinary shares taken up. £393,000 paid on 40,000 preference and 353,000 ordinary shares. £7,000 considered as paid on 7,000 ordinary shares. Mortgages and charges nil.

C. Barnett, Ltd.—Debenture dated May 31st, 1928, to secure £200, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: C. Barnett, 77, Whyteville Road, Forest Gate, E.7.

City Notes.

New Issue.

Baird International Television, Ltd.—Particulars of the formation of this company are given in the "New Companies" section of this issue. The directors are: Lord Ampthill (chairman), Sir Edward Manville, Lt.-Col. G. B. Winch, and Messrs. J. L. Baird and O. G. Hutchinson. On Monday last the company offered for subscription 1,000,000 "A" shares of 5s. each, at a premium of 1s. per share. The 1,400,000 "B" shares are to be issued as fully paid to the vendors, Television, Ltd., while they also have the call of the remaining 400,000 "A" shares at 6s. each. The "A" shares are entitled to a fixed cumulative preferential dividend of 10 per cent., and to 40 per cent. of the distributable profits after the payment of that dividend. The "A" and "B" shares have each one vote. The company acquires 300,000 fully-paid deferred ordinary shares of 1s. each in the Baird Television Development Co., Ltd., the market value of which is said to exceed £300,000. It is also entitled to a third of the proceeds of the sale and exploitation of the foreign and Colonial patents and rights of the Baird Television Development Co., Ltd. The prospectus says: "It will be the policy of the board to form, or collaborate in the formation of, manufacturing and marketing companies in such of the Dominions, Colonies and foreign countries as may seem to offer the best opportunities for the commercial exploitation of television and other inventions." These inventions cover: Television, "noctovision," "phonovision" on gramophone records, facsimile telegraphy and automatic synchronism. It is mentioned that an American company has been formed to manufacture and market apparatus in the United States, Canada and Mexico. "It is expected that a televisor of popular character will shortly be on the market in considerable quantities in the United States of America at prices which will produce substantial profits. Types of this apparatus will be exhibited, and on sale at the forthcoming Wireless Exhibition at Olympia." The proceeds of the issue are expected to provide a working capital of over £250,000.

As the list closed on the morning of the day of issue, we are deprived of the opportunity of commenting effectively upon this flotation, and can now only condole with those who have already engaged in so speculative a venture. With all respect to the talented inventor, and to the distinguished men whose names appear as directors of the company, we must repeat that tele-

vision up to the present has taken the shape of promise rather than performance, and that its prospects of success appear to us to partake of the nature of "vision" in the sense of unreality rather than that of actual accomplishment.

As reported in our last issue (p. 1097), the Postmaster-General has waited since last September for "a further demonstration, but so far this promise had not been fulfilled." In our opinion the art of television is not even in its infancy, but in the embryo stage, and is not in a fit state to place before the public in its naked immaturity. Some previous comments appear in the ELEC. REV. of April 29th, 1927 (p. 689) in connection with the prospectus of the Baird Television Development Co., Ltd.

Whitehall Electric Investments, Ltd.

This company's report was reviewed in our last issue (p. 1103). The annual meeting was held on June 21st, and in the course of his speech, the chairman (the Hon. Clive Pearson) said that the Chilean operating companies maintained their progress. The Chilena Company had erected a new hydro-electric plant at Maitenes with h.p. transmission lines to Santiago, Valparaiso, and intermediate towns; the company had also reconstructed the Santiago distribution system. Similarly the Valparaiso Company had reconstructed and extended its distribution system. The Chilena Company had also made Santiago one of the best-lighted cities in the world but had difficulty in collecting payment from the municipal authorities. The Santiago tramways had shown better results but omnibus competition was still a serious menace, and that was also the case in Valparaiso. A tentative agreement had been reached between the Chilena Company and the Government regarding the company's concessions, and a new law was to be passed consolidating the concessions and contracts. The new Maipo hydro-electric plant was completed within programme time and commenced operation in March; the plant could supply a base load of 24,000 kW and a peak load of 43,500 kW. The eventual development of the Volcan river would add 18,000 kW to the plant. During the year the Chilean exchange rate had remained constant at, or slightly above, the legal value. The outlook in Mexico was better but the past year was no less difficult than 1926. Earnings again suffered from the unfavourable monetary situation which, however, had since improved. The difficulties encountered by the Tampico Company had resulted in a reduction of the preference dividend from 5 to 2 per cent. The Puebla Company's gross earnings were greater, but owing to the higher expenses the net result was slightly lower. Additional power was now being delivered to the newly-electrified section of the Mexican Railway from Cordoba to Paso el Macho. The Vera Cruz Company showed improvement in all departments and its outlook was better now than for some time past. The earnings of the Orizaba and Cordoba Companies were somewhat lower. In conclusion, Mr. Pearson said that reports from Chile were encouraging and there were indications of improvement of Mexican conditions.

Callender's Cable and Construction Co., Ltd.

Brief mention of this company's report for the year ended December 31st, 1927, was made in our last issue. The following are some further points from the report: The appropriation from the profit of £357,378 in respect of depreciation was £45,000. The long-expected Government scheme for the widespread supply of electricity throughout the country was delayed much more than was anticipated, and many important mains contracts which depended thereon and were expected to be placed during the year have not yet materialised. Now that the plans of distribution are known, the incidental cable work will be shortly undertaken. The company was, however, able to secure many important contracts in England and Scotland for the supply and laying of cables which kept the factory well occupied, and the resulting profit cannot be considered unsatisfactory. The important contract for the electrification of the suburban lines of the Bombay, Baroda and Central India Railway has been completed, and the work has given great satisfaction. A large contract was recently secured for overhead lines in Hungary. The board is devoting continuous attention, not only to the cable business, but to similar overhead work at home and overseas. The operations of the Anchor Cable Co during the past year were entirely satisfactory, and enabled that company to increase its dividend. The Okonite-Callender Cable Co., Inc., in which the company is largely interested, has made substantial progress, and has now taken its position as one of the leading manufacturers of cables in the United States. The report records the death of Mr. C. H. McEuen, for 25 years a director, and the appointment of Mr. E. G. Buxton, J.P., to the board. A separate notice was circulated with the report calling an extraordinary meeting after the general meeting yesterday (Thursday) for the purpose of considering a resolution which provided for the creation of 500,000 ordinary shares of £1 each. A report of the meetings will appear in our next issue.

British Electric Traction Co., Ltd.

The annual meeting was held on June 18th, Mr. J. S. Austen (chairman) presiding. In presenting the report and accounts (ELEC. REV., June 15th, p. 1058), the chairman said the company's Worcester undertaking had been sold to the Corporation and the tramway handed over. Referring to the British Automobile Traction Co., in which a very large part of the company's omnibus interests, with Messrs. Tillings, were centred, the chairman said they had handed over to the former company a number of other omnibus interests and were to receive in return payment in shares. The result would be reflected in the next report. The name of the British Automobile Traction Co. was being changed to that of Tilling & British Automobile Traction. In connection with the Bills, which were being promoted for the purpose of enabling railway companies to run omnibuses, Mr. Austen said that if the railway companies were going to spend large amounts simply for the purpose of creating competition, the result must be that the company would lose a considerable amount of profit. If, however, the railway companies' object was only to participate with them in the profits which might be derived from road transport, then he thought they might look upon the result of the Bills with a certain complacency.

In conclusion, Mr. Austen dealt with the company's financial policy, and the motion was seconded by Mr. E. Garcke (deputy-chairman) and carried. Later the shareholders approved a resolution providing for the capitalisation of £13,263 of the year's profit with a view to its distribution as a bonus in the form of deferred ordinary shares.

General Electric Co., Ltd.

The directors' report for the year ended March 31st last records a profit of £1,057,867, as compared with £1,030,853 in 1926-27 and £1,076,809 in 1925-26. The addition of £333,982 brought forward gives an available balance of £1,391,849. From this are deducted debenture interest, depreciation (£195,433), contribution to pension fund (£21,405), preference dividends, and allocation to reserve (£130,000, against £140,000), leaving £563,821. It is proposed to pay a dividend of 10 per cent. on the ordinary shares (against 7½ per cent.) and to carry forward £338,456. The directors state that the slight improvement in the profit indicates the gradual recovery of industry from the chaos of the preceding year, and they therefore feel justified in recommending an increased dividend. The prevailing peace in industry has enabled the company's works to be continuously employed. In heavy engineering the volume of orders has been well maintained, both home and overseas, but the prices secured are still unsatisfactory. The demand for general electrical commodities has shown steady expansion and has necessitated the acquisition of a new factory in Birmingham. Overseas trade has shown a further increase in volume. The branches in India and Argentina have had a successful year's trading but in other territories difficult conditions continue. The liquid resources of the company increased by £476,000 during the year to £1,780,000. The reserve account now stands at £1,100,000. The number of employés rose by 900 to 19,600. Mr. M. Solomon has been appointed a director. The annual meeting is to be held on July 3rd.

Anglo-Argentine Tramways Co., Ltd.

The gross receipts for the year ended December 31st last amounted to £4,658,618 and the net revenue to £1,011,640, as compared with £4,495,401 and £991,205 respectively in 1926. After adding interest and providing for debenture interest, &c., there remains £374,401, to which is added £45,812 brought forward, making £420,216. The dividends are paid on the first and second cumulative preference shares, leaving £61,216 to be carried forward. Both the passengers carried and the traffic receipts increased, but the ratio of working expenses to revenue was slightly higher. The allocation to renewals reserve is increased from £250,000 to £368,666. Several steps have been taken to improve traffic conditions in Buenos Aires. The company's omnibuses have not yet proved remunerative in themselves but they are of value as feeders to the subway. Competition has been severe, but restrictions have now been imposed by the authorities. No decision has yet been arrived at by the Municipal Council with regard to a revision of tariffs and the development of the subway can therefore still not be proceeded with. This development is vital in view of the continually increasing traffic of the city. The general manager's report states that the economic position of Argentina is very good, and the monetary situation is stable, the country now being on a free gold basis. Buenos Aires continues to develop satisfactorily. The general manager also gives details of the company's work during the past year.

Madras Electric Supply Corporation, Ltd.

Mr. J. Gray presided at the annual meeting on June 20th, in the absence of the chairman (Mr. J. G. B. Stone). In presenting the report and accounts (*vide* our last issue, p. 1102), Mr. Gray said that they indicated developments in every part of the business; in comparing the business with that of other large Indian electrical companies, however, the exceptional conditions characteristic of Madras must not be overlooked. Power users were coming to recognise the superiority of electricity, and the company had framed a favourable schedule of prices; there was also an increased domestic demand. The Government had approved the supply of electricity to a large railway company, and they hoped that satisfactory terms would be arranged. He regretted that there was no return upon their tramway investment. The chairman of the tramway company had pointed out that the unsatisfactory results were due to uneconomic omnibus competition. In concluding his speech, Mr. Gray said that his decision to resign the chairmanship was due to the pressure of other duties. Their agent and chief engineer in Madras (Mr. Jones) had decided to retire on account of ill-health. Following upon the adoption of the report, appreciative references were made to the services of Messrs. Gray and Jones.

Kalgoorlie Electric Power and Lighting Corporation, Ltd.

Speaking at the annual meeting on June 21st, the chairman (Mr. G. C. Howard) reviewed the past year's financial results (*vide* our last issue, p. 1103), and said that so far this year the receipts had remained on about the same level. Their manager had been complimented by a Federal Government Committee upon the plant. A local gold-mining company had recently discovered a profitable reef, and it was expected that the company would be asked to supply additional power. The demand could only be met by an extension of the plant, which was at present almost fully loaded. It had been said that the board was too conservative in its financial policy, but it had been able to relieve the ordinary capital of a burden of £110,000 by the redemption of debentures. Without being too sanguine, he could say that the prospects of the company were more cheerful than they had been for many years.

Electramonic Co., Ltd.

Sir Philip Dawson, M.P. (chairman) presided at the statutory meeting on June 21st. He said that the equipment of the factory had cost materially less than was estimated; the company accordingly had more available as working capital—£50,000. The factory at Bear Gardens, Hammersmith, was well equipped and staffed and deliveries had commenced. A recording studio was being installed and at the Regent Street showrooms daily demonstrations of the company's instruments were being given. Their "super-theatre" model had met with a good demand and they could foresee a very extensive business. They had received orders and inquiries for agencies from many overseas towns. A new company was being formed to which the company had allocated its foreign rights on satisfactory terms. Mass production of a portable wireless set for another concern was being started; an order for 10,000 had been received. In conclusion, the chairman referred to the company's "Philmphone" apparatus, which was afterwards demonstrated to the shareholders.

Perak River Hydro-Electric Power Co., Ltd.

On June 20th a meeting of the holders of the company's 7 per cent. participating debenture stock was held to consider a proposal to issue £250,000 more of the stock to rank equally with the existing stock. Viscount Elibank (chairman) presided, and reviewed the company's operations. He said that the demand was originally estimated at 100 million kWh per annum, but later investigations had shown that it would possibly reach 260 millions; negotiations had already been made with regard to 150 millions. To meet the demand in the first place it was necessary to increase the capacity of the power station from 5,000 to 18,000 kW, and it was proposed to raise the requisite funds by the issue of additional debenture stock. It was not intended to make the issue for a period of from 12 to 18 months, and when it was made the stock would be offered to existing stockholders at a pri- not below par, which it was anticipated would be below the market price at the time of issue. The resolution was carried.

Aluminium Corporation, Ltd.

The directors' report for the year ended December 31st, 1927, shows a profit of £54,669, against £36,225 in 1926. Debenture interest, &c., absorbed £102,706; thus there is a deficit of £48,037. This is added to the adverse balance of £76,348 brought forward and £5,658 for depreciated value in the stock of stores, making a total debit balance of £130,043 to be carried forward. The inlet and outlet of the Eigiau-Cowlyd tunnel will shortly be completed. Supplies of aluminium have been coming forward regularly from the company's Norwegian associate, and the output of the company's own furnaces at Dolgarrog shows a substantial increase. There appears to be no falling off in the demand for the metal, and the sales department has already secured a market for practically the whole output for the current year at satisfactory prices. The meeting was held on Tuesday last, and a report will appear in our next issue.

North Wales Power Co., Ltd.

There was a small decrease in the profit for the year ended December 31st last, the figure being £47,572, against £49,977 in 1926. After meeting debenture interest there is a balance of £6,404. Of this, £5,000 has been placed to special renewals fund and £1,404 to the special interest reserve fund. (Last year's balance of £25,051 was also transferred to the latter fund.) The report makes mention of the issue of £300,000 of 5 per cent. second mortgage debenture stock under a Trade Facilities Acts guarantee, bringing the total thus guaranteed to £2,000,000. To meet the increased demand for energy an additional amount had to be purchased, and the sales showed an increase of 26 per cent. The meeting was to be held on Wednesday last.

Mexican Light and Power Co.

The accounts for the past year show gross earnings of $20,427,428 (Mex.), against $19,714,021 in 1926. After meeting operation expenses, maintenance, taxes and depreciation there was a net income of $10,075,565 (Mex.), against $9,529,742. The available balance in Canadian currency, after providing for expenses, bond interest, &c., amounts to $1,264,321. Dividends in respect of the half-year ended October 31st have been paid on the 7 per cent. preference shares and the 4 per cent. second preference shares, and a balance of $940,321 is carried forward. Reference is made in the report to the scheme of arrangement by which arrears of interest and dividends on the outstanding bonds and 7 per cent. cumulative preference shares have been discharged. The report also mentions that the amounts due from the Federal State and Municipal Governments show a further increase.

Mexico Tramways Co.

The total earnings of this company for 1927 amounted to $11,010,865 (Mex.), against $9,931,280 in 1926, and the net earnings to $885,659 (Mex.), as compared with $78,504. The improvement is attributed largely to changes introduced in March last year and the increased rolling stock. The report deals fully with the scheme of arrangement made by the Mexican Light & Power Co., and says that considerable loss was again suffered by the unfavourable rate of exchange between Mexican and Canadian currency. No progress has been made in connection with the claim for damages which the company has made against the Mexican Government.

Canadian Marconi Co.

The profit for the past year rose from $24,362 to $46,555. The report says that some progress was made during 1927, and the "beam" service with Great Britain is now operating satisfactorily. The work on the Australian "beam" service is now complete, and it is hoped to commence operation shortly. The radio set and apparatus branch recorded increased volume and profit. During the year 1,124,040 $1 shares were issued. The cash advances from the English Marconi Co. were reduced from $644,052 to $50,000, and the remainder is to be liquidated by the issue of capital stock. The surplus now stands at $108,982, with the addition of the past year's profits.

English Electric Co. of Canada.

The company reports a net profit of $178,577 for 1927, as compared with $163,157 in 1926. It is proposed to reorganise the capital by substituting for the existing 20,000 $100 preferred and 30,000 no-par-value common shares, 50,000 shares each of classes "A" and "B" stock, all of no par value. The "A" stock will be redeemable at $55 per share and will receive a non-cumulative dividend of $3 per share plus an equal participation with the "B" stock. The holders of the preferred share are to receive two shares of "A" stock and half a share of "B" stock for each share held and their arrears of dividend. The holders of the common shares will receive an equal number of shares of "B" stock.

British Columbia Power Corporation.

The *Financial Times* reports that Mr. J. A. Nesbitt (Nesbitt Thomson & Co., of Montreal) stated recently that all the stock of this corporation, which recently acquired the control of the British Columbia Electric Railway Co., Ltd., had been sold. An urgent demand had been received from Great Britain for more stock than had been allotted, but it was withheld in order that the requirements of Canadian investors could be satisfied. Of the total, Canadian investors took $30,000,000, while $21,000,000 went to Great Britain and $9,000,000 to the United States. Mr. Nesbitt said that British Columbia had a great future, and Vancouver would some day be the second largest city in Canada.

Triumph Trust, Ltd.

Sir William Mills (chairman), speaking at the annual meeting on June 21st, said that the past year's results were fairly satisfactory. The net profit had risen from £19,155 to £19,543, and they had written down investments out of revenue by £5,172. Their investments stood in the balance sheet at the market prices and amounted to £63,038. It was proposed to maintain the preferred ordinary dividend at 10 per cent. Although more might have been paid the directors considered it better not to do so in view of the curtailment of the company's hire-purchase business and the policy of conversion into an investment trust which the directors had in view.

Greenwood & Batley, Ltd.

The net profit for the year ended March 31st last was £30,511 (against £30,175 in 1926-27). A balance of £13,395 brought forward is added, making £43,906. From this, £6,000 is allocated to depreciation, and a final dividend of 2½ per cent. is recommended on the ordinary shares, again making 5 per cent. for the year. £13,459 is carried forward. Meeting: July 2nd.

Nico Light Co., Ltd.

This company reports a net trading profit of £2,295 for the year ended March 31st (against £1,303 in the preceding year). A balance of £2,826 brought forward is added, making £5,121. A dividend of 5 per cent., free of tax (as last year) is recommended, leaving £2,415 to be carried forward.

W. T. Henley's Telegraph Works Co., Ltd.

Subject to audit, the directors recommend a final dividend on the ordinary shares of 2s. 6d. per share, making 4s. per share for the year. They also recommend a cash bonus of 1s. per share. It is proposed to pay the dividend and bonus on July 13th.

St. James' and Pall Mall Electric Light Co., Ltd.

An interim ordinary dividend of 9d. per share has been declared.

Kidderminster and District Electric Lighting and Traction Co., Ltd.

The report for the past year shows a net revenue of £9,993 (against £7,545). A balance of £465 brought forward is added, making £10,458. From this expenses and renewals are deducted, and it is proposed to place £990 to reserve and to pay a dividend of 5 per cent. on the ordinary shares (against 2½ per cent.), leaving £505 to be carried forward. After meeting the cost of renewals the profit of the Kidderminster and Stourport Tramway Co. was £19.

British Empire Trust, Ltd.

A rise in the net profit for the year ended April 30th last, from £71,210 to £240,826 is said by the directors to be largely attributable to the realisation of the company's holdings of preferred and deferred stock of the British Columbia Electric Railway Co., Ltd. The dividend on the trust's preferred ordinary shares is raised from 6 to 7 per cent., and that on the deferred ordinary shares from 8 to 9 per cent. It is also proposed to capitalise £90,677 for issue to shareholders in the form of 5 per cent. cumulative perpetual preference shares.

Stock Exchange Notices.

The undermentioned securities have been ordered to be officially quoted :—

Atlas Light & Power Company.—530,000 7 per cent. preference shares (cumulative) of £1 each, fully-paid, Nos. 2,000,001 to 2,530,000.

Underground Electric Railways Company of London.—18,131 ordinary shares of £1 each, fully-paid, Nos. 5,483,039 to 5,501,169.

Dubilier Condenser Co. (1925), Ltd.

The net profit for the year ended March 31st last amounted to £33,331, as compared with £12,260 in 1926-27. After meeting taxation and adding a balance of £4,117 brought forward, it is proposed to pay an ordinary dividend of 5 per cent. for the year and to carry forward £12,006. No ordinary dividend was paid in respect of the preceding year. Meeting : July 3rd.

Marconi's Wireless Telegraph Co., Ltd.

The dividend on the 7 per cent. cumulative participating preference shares for the half-year ending June 30th, has been declared.

The directors have announced their intention to redeem the whole of the outstanding 6½ per cent. convertible 10-year debenture stock on October 1st. The redemption will be made in cash with a 5 per cent. premium. The option to exchange these debentures for shares will expire on September 9th.

Victoria Falls and Transvaal Power Co., Ltd.

A final dividend of 1 per cent. has been declared on the preference shares, making 10 per cent. for the year. The ordinary shares are to receive a final dividend of 12 per cent., making 18 per cent. for the year, as for 1926.

Companies Struck off the Register.

The names of the undermentioned companies have been struck off the Register and they are thereby dissolved :—

Fleet Electric Co., Ltd.

New British Electric Supply Co., Ltd.

Company to be Struck off the Register.

The name of the undermentioned company will be struck off the Register at the end of three months unless cause is shown to the contrary :—

Granville Electrical & Motor Co., Ltd.

Scottish General Transport Co., Ltd.

The revenue for 1927 was £35,112, and after meeting expenses, loan interest, and depreciation, and adding £4,789 brought forward, there is a balance of £81, which is carried to the next account.

Chadburn's (Ship) Telegraph Co., Ltd.

The result for the year ended March 31st last was a profit of £2,655 (against a loss of £6,405 in 1926-27). This is set against the debit balance brought forward, reducing it to £1,570.

Montreal Light, Heat and Power Consolidated.

A dividend of $0.5 per share has been declared on the common shares for the quarter ending June 30th.

International Telephone and Telegraph Co.

The regular quarterly dividend of 1¼ per cent. has been declared.

French Companies.

The *Compagnie des Lampes* records net profits of 23,553,000 fr. for 1927. A dividend of 14 per cent. is being paid, as compared with 12 per cent. for 1926.

The *Compagnie Parisienne de Distribution d'Electricité* reports that the sum of 38,374,000 fr. is available for disposal for 1927; the dividend is at the rate of 65 fr. gross per share, as in 1926.

German Company.

The *Accumulator Works Company*, of Berlin and Hagen, states that the turnover in portable batteries increased, particularly starter and radio batteries, but the sale prices were low owing to home and foreign competition. The net profits were 2,180,000 marks, as against 1,992,000 marks in 1926, the dividend remaining at 8 per cent.

Stocks and Shares.

MONDAY EVENING.

THE first half of the year finishes with Stock Exchange markets in a condition that is best described as subdued. There had been violent gambling during April, May and part of June, by New York, Montreal and Brussels operators. In one of these centres, charwomen, office-boys and costermongers are said to have joined in the wild scramble for rapid wealth promised them by those who were buying stocks and shares at fancy prices, and handing them over to small trusts or syndicates which were nothing better than mere gambling pools. Deflation was bound to come. Serious financial difficulties have inevitably arisen which led to wholesale selling of stocks and shares on the part of the foreign operators. The speculation in this country has been of a much milder form altogether, but in the repercussion—to use the fashionable word—that has followed from the slump abroad, numbers of British securities have fallen heavily in price. The two leading counters, around which speculation has run highest, are International Holdings and Hydro-Electrics; the latter were introduced to the Stock Exchange market early this year, and, from the neighbourhood of 30, the price rushed up to 86, from which it had descended to 48 at the time of writing. A few of the other dollar utility stocks and shares have been swept into the maelstrom of disturbance created by the furious fall in prices of these two issues: but so far as the great bulk of British investment securities are concerned, the effect has been, if not negligible, then comparatively innocuous. An examination of our share-lists of English electricity supply companies, for instance, will show that the prices in to-day's list have scarcely moved from those of a week ago: and, in fact, they are very much the same as the quotations current at the beginning of the year, before the industrial boomlet started on its rampant course.

Home Railway Heaviness.

No little interest is aroused in the evidence which has been given in the course of the opposition raised to the Bill for obtaining road powers that the railway companies are endeavouring to secure. This opposition comes from all sorts of people, and meanwhile the prices of Home Railway stocks steadily fall. The Tube issues suffer less than the others, because they are not subject to the same influences, though the market is coloured by the drabness which has overspread the list as a whole. Metropolitans and Districts are, however, both lower. Rather oddly, the Metropolitan's Surplus Lands stock has hardened, to 77. Underground incomes shed 3 points, to 122. The company's new debentures stand at 2 premium, and it may be added that the new Tokio Electric 6 per cent. bonds, for which there was such a scramble when the lists opened earlier in the month, have gone back to 2¼ premium, after being a point higher. British Electric Traction preferred is 2 up. The deferred stock, showing a nominal drop of 30 points, is ex the bonus.

Wireless and Cable.

Marconis continue to attract lively attention by reason of the dividend outlook. The last dividend paid by Marconis was 5 per cent. on the 10s. shares, that is, 6d. per share; present calculations look for this to be doubled. A 10 per cent. dividend, that is, 1s. per share at the present price of 62s. 6d., would give a very poor yield on the money, and this consideration led to a certain amount of selling by holders who think that they may be able to replace their shares at a lower price when the figures come out. To some extent, also, the market is affected, as is that for the Eastern cable quartette, by sympathy with the slump in industrials that have an American flavour, for large purchases of Marconis were made, it is claimed, by American interests, and possibly some of the shares are being realised in order to provide money with which to meet losses incurred over speculative transactions. The cable group shows heaviness, Easterns being down 3 points, and relative falls occurred in Eastern Extensions and Western Telegraphs. Globes are 10s. down at 21½. International Telephone and Telegraph has dropped to 167½.

Mexican Matters.

Mexican utilities are inter-related with the industrials, around which there has been so much speculation in Brussels; and, in consequence of this, prices are dull and heavy. Mexico Tramways have dropped to 32½, about 12 points lower than they stood early in May. The news from the country itself has a conflicting effect upon prices. An earthquake occurred in Mexico City some ten days ago, described as being probably the most severe for many years, and causing a panic in the city, though no damage, it is said, was done to the Mexican Light and Power property. Meetings of the shareholders in both of these companies will be held in Toronto on July 24th, and a good deal of interest awaits the speeches of the chairman, for these Mexican utilities have become fairly popular as a medium during the past twelve months. The reports, just out, had no effect upon the prices of either company's issues.

British Columbia Power.

Details are available of the recent stock issue by the British Columbia Power Corporation, which acquired, under dramatic circumstances, control of the British Columbia Electric Railway. The demand from this country for the British Columbia Power shares was considerable—no less than 350,000 shares having been taken, to the value of 21 million dollars. The Canadians took 30 million dollars' worth of shares, and the United States about 9 million dollars. The future industrial development of the province is the chief factor in the dividend-earning possibilities of the stock of the new Corporation. From the point of view of the austere critic it may be said that the shares are distinctly speculative in character, that the price at which they were issued in exchange for the British Columbia Electric stocks appears to be decidedly high, but that, if everything goes according to programme, the shares may turn out to be a profitable investment.

Anglo-Argentine Trams.

The Anglo-Argentine Tramways report shows that the company did better in the past year than in the preceding twelve months, but the directors state their regret at having again to announce that no decision has been reached in connection with the revision of tariff around which question so much discussion has taken place between the company and the Municipality for years past. The Board adds its great desire to see this long-outstanding question settled, in order that the company may be enabled to proceed with its policy of expansion. Possibly there may be some definite announcement made on the point at the meeting to be held next Tuesday, July 3rd. The 5½ per cent. first preference shares fell 1/16 to 3⅞, bringing them into line with the 6 per cent. second preference.

Equipment Companies.

Several interesting reports have appeared during the past week from companies engaged in electrical equipment manufacturing. The General Electric announces a dividend, making 10 per cent. for the year, and its report shows a steady increase in profits, although the extra 2½ per cent. paid in dividend has not been fully earned. The company made £1,057,867—an increase of about £27,000 on the year, but about £19,000 less than the profit for the year ended March, 1926. The increase in last year's profits is held by the directors to indicate the gradual recovery of industry from the chaos of the preceding year, and this is the justification for their recommending a higher dividend rate. Demand for general electrical commodities has shown steady expansion, and has necessitated the acquisition of a new factory in Birmingham. The price of the shares is unchanged at 38s.; the preference are a trifle easier at 24s. 6d.

Henley's Telegraph Works have declared a dividend and bonus, making for the year 25 per cent., the same as before, and the price remains unchanged at 5⅞. Some people had been expecting that the company would increase its dividend. The high price of the shares, 5⅞, affording a yield of 4¼ per cent. on the money, testifies to the firm belief which investors entertain in the future of the concern, and possibly the hope of a new issue of capital on bonus terms to be made sooner or later is an anticipation that serves to keep the price at what looks like an exalted level for the shares even of such a first-rate undertaking as Henley's is. Chadburn's accounts show a profit of about £2,700, as against a loss last year of over £6,000, and the debit balance is now a bagatelle.

English Electrics have recovered to 7s. 6d., Metropolitan-Vickers ordinary are better at 32s., and Callenders regained the 1/16 decline of a week ago. British Aluminium have reacted to 46s. 3d. India-Rubber shares are lower at 15s. on disappointment with the report, and a fall of £1 has lowered Telegraph Constructions to 25½. The engineering, iron and steel list is steady, some attention having been paid to Vickers on the idea that the new shipbuilding expansion which is to be undertaken by some of the leading lines will benefit Vickers. The rubber share market remains dull, and the price of material keeps in the neighbourhood of 9¼d. per lb.

New Comers.

A new issue by the Baird International Television Company has been made this week, a million 5s. shares being offered at a premium of 1s. per share. Allotments of the new Scottish Power shares will be out before these Notes are. An issue of debentures is about to be made by the Bermudas Traction Company. (There are no motor-cars, the advance prospectus states, in the island.) Interest during the construction of the new line will be paid out of capital.

Electricity Supply.

The market for electricity supply shares is a little easier in places: Metropolitans have fallen to 45s., Electric Supply Corporation to 51s. 3d., County of London to 36s. There are small falls in Scottish Power, Clyde Valley, Midland Counties, and Bournemouth and Poole. On the other hand, Midland Electric Power Distribution shares have risen to £2, and Yorkshires are better at 34s. The dullish disposition reflected in the first-named movements is due to the less cheerful feeling pervading most parts of the Stock Exchange. The North Wales Power Company announces a profit of £47,600 for 1927, a decrease of £2,300 on the previous year. Melbourne Electric Supply ordinary stock at 174½ is a point or so up on balance.

Share List of Electrical Companies.

	Nom. £	Dividend. 1926.	1927.	Price June 25, 1928.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	14†	15	2⅝	−⅛	... ...
Brompton Ordinary	1	8½	8½	25/6	—	5 9 10
Charing Cross Ordinary	1	8½	8½	27/-	—	5 8 8
do. do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8¾	8¾	26/6	—	5 5 8
City of London	1	10	10	30/9	—	4 11 1
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	28/6	−6d.	4 3 0
County of London	1	7½	7½	36/-	−2/6	4 3 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	51/3	−⅛	4 5 9
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	29/-	—	5 3 5
London Electric	1	8½	8½	26/6	—	5 5 10
Metropolitan	1	8	9	2½	−⅛	4 0 0
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	30/-	−6d.	4 6 8
Mid. Elec. Power	1	—	15	40/-	+⅛	... ...
Newcastle-on-Tyne Ordinary	1	5	6	26 3	−⅛	4 11 5
do. 7% Pref.	1	7	7	26 6	—	5 5 8
Notting Hill 6% Pref.	10	6	6	10⅝	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	8	8	27/-	—	5 3 8
Scottish Power	1	8	8	29/6	−6d.	5 10 4
South London	1	8½	8½	26/6	—	5 5 8
Urban Ordinary	1	7	7	31/3xb	—	... ...
Westminster Ordinary	1	8½	8½	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/9	—	6 6 4
Yorkshire Elec.	1	8	8	34/-	+6d.	4 14 2
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	78	—	5 9 7
Metropolitan	,,	3	3	68	−2	4 8 3
do. District	,,	3½	4	73½	−1½	5 8 10
Underground Electric	£1	1½	5	26/-	−6d.	3 17 0
do. do. Income	Bonds	6	6	122	−3	4 18 4
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	100½	—	5 19 5
do Def.	,,	1½	1½	24½	—	6 3 9
Automatic Telephone	1	10	10	45/-	—	4 9 0
Eastern Extension	10	10	10	20⅝	−1½	*4 16 5
Eastern Tel. Ord.	Stock	10	10	217	−3	*4 12 2
Globe Tel. and T. Ord.	10	10	10	21½	−½	*4 13 0
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	20	20	39½	+½	5 1 3
Indo-European	25	10	10	42½	—	*5 17 8
Marconi	10/-	5	—	62/6	−⅛	0 16 0
Marconi-Marine	1	8⅝	12½	46/-	−2/-	5 8 8
Oriental Telephone Ord.	1	12	12	52/6	—	*4 9 3
United R. Plate Tel.	5	8	8	11⅛xd.	—	*8 12 0
Western Telegraph	10	10	10	20½	−1½	4 17 7
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	8¾	−⅛	7 2 0
do. do. 2nd Pref.	5	6	6	8½	—	7 14 10
do. do. 5% Deb.	Stock	5	5	78½	+2	6 11 2
British Electric Traction Def. Ord.	,,	—	—	500xr.	—	... ...
do. do. Pref. Ord.	,,	8	7½	127½	+2	5 17 8
Brazil Traction	100	6	7	54½	−2	3 4 3
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	90½	—	5 3 8
do. do. Preferred	,,	6½	6½	96	—	*2 6 9
do. do. Deferred	,,	8	8	307	—	*2 12 1
London & Sub. Trac. 5% Pref.	1	Nil	Nil	9/6	—	... ...
London United Tram Deb.	Stock	4	4	61½	—	6 10 0
Mexico Trams, 5% Bonds	—	5	5	85½	−1	5 17 0
Mexican Light Common	100	Nil	Nil	75	—	... ...
do. 7% Pref.	100	Nil	7	79	—	8 17 2
do. 1st Bonds	—	5	5	83½	—	6 1 3
Yorkshire (West Riding)	1	Nil	Nil	7/6	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	13	15	67/6	—	*4 9 0
British Aluminium Ord.	1	10	10	46/3	−⅛	*4 6 7
British Elec. Transformer Pref.	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4¼	—	3 11 6
Brush Ord.	1	10	10	29/9	—	6 19 8
Callenders	1	15	15	4¼	+⅛	3 10 6
do. 6½% Pref.	1	6½	6½	23/-	—	5 9 0
Crompton Parkinson Pref. Ord.	1	—	—	18/-	—	... ...
do. 8% Pref.	1	—	8	26/3	+⅛	6 2 0
Edison-Swan	4/-	10	10	12.6	—	3 4 0
do. 5% Deb.	Stock	5	5	90	—	5 11 0
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Pref.	1	7½	7½	26/3	—	5 14 3
English Electric	1	Nil	Nil	7/6	+6d.	... ...
do. do. Pref.	1	3	Nil	11/3	—	... ...
Gen. Elec. Pref.	1	6½	6½	24 7xd.	−6d.	5 6 1
do. Ord.	1	7½	10	38/-	—	3 19 0
Henley	1	25	25	5⅞	—	4 3 4
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	15/-	−9d.	... ...
Johnson & Phillips	1	12½	10	42 6	—	4 14 1
Met.-Vickers Ord.	1	8	6	32/-	+9d.	3 15 0
do. Pref.	2	8	8	2¾	—	6 1 11
Siemens Ord.	1	7½	7½	27/6	−9d.	5 9 1
Telegraph Construction	12	10	10	25½	−1	*4 18 0

* Dividends paid free of Income Tax.
† 4% of which was Tax Free.

South African Electrical Trade.

Figures for 1926 and 1927 Compared.

THE following statement, showing the imports of electrical and similar goods into the Union of South Africa during the year 1927, has been compiled from the recently-issued official trade statistics. The figures for 1926 are added for purposes of comparison, and notes of any increases or decreases are made.

	1926. £	1927. £	Inc. or dec. £
Electrical cable and wire—			
Total	604,000	603,000	– 1,000
From Great Britain ...	554,000	553,000	– 1,000
„ United States ...	5,500	6,000	+ 500
„ Germany	41,000	32,000	– 9,000
„ Belgium	3,000	4,000	+ 1,000
„ Holland	200	5,500	+ 5,300
Heating and cooking apparatus—			
Total	69,000	80,000	+11,000
From Great Britain ...	35,000	34,000	– 1,000
„ United States ...	12,000	10,000	– 2,000
„ Germany	6,000	9,000	+ 3,000
„ Canada	15,000	25,000	+10,000
Meters, electric—			
Total	34,000	22,000	–12,000
From Great Britain ...	26,000	16,000	–10,000
„ Germany	6,000	2,500	– 3,500
„ United States ...	1,000	1,500	+ 500
„ Switzerland ...	—	2,000	—
Insulators—			
Total	10,000	10,000	—
From Great Britain ...	3,000	6,500	+ 3,500
„ United States ...	6,500	2,000	– 4,500
„ Germany	1,000	1,000	—
Electrical material, other—			
Total	30,000	43,000	+13,000
From Great Britain ...	12,000	17,000	+ 5,000
„ United States ...	5,500	8,000	+ 2,500
„ Germany	4,000	4,000	—
„ Italy	1,500	2,500	+ 1,000
„ France	4,000	1,000	– 3,000
„ Sweden	1,500	8,000	+ 6,500
Electric hand lamps—			
Total	16,000	20,000	+ 4,000
From Great Britain ...	2,500	2,500	—
„ Germany	2,500	4,500	+ 2,000
„ United States ...	11,000	13,000	+ 2,000
Other electric lamps, globes, &c.—			
Total	141,000	136,000	– 5,000
From Great Britain ...	80,000	60,000	–20,000
„ Austria	6,000	10,000	+ 4,000
„ Germany	13,000	15,000	+ 2,000
„ Holland	31,000	30,000	– 1,000
„ United States ...	8,000	11,000	+ 3,000
„ Hungary	2,500	6,000	+ 3,500
Electric lighting outfits, self-contained—			
Total	25,500	17,000	– 8,500
From Great Britain ...	8,000	4,000	– 4,000
„ United States ...	17,500	12,600	– 4,900
Wireless apparatus and parts—			
Total	56,000	45,000	–11,000
From Great Britain ...	45,000	37,000	– 8,000
„ United States ...	9,000	5,500	– 3,500
„ Germany	600	1,000	+ 400
„ Denmark	800	—	—
„ France	800	—	—
„ Holland	500	1,000	+ 500
Telegraph and telephone material—			
Total	62,000	41,500	–20,500
From Great Britain ...	41,000	21,000	–20,000
„ Sweden	4,000	5,000	+ 1,000
„ United States ...	4,000	6,000	+ 2,000
„ Germany	10,000	5,000	– 5,000
„ Belgium	3,000	3,600	+ 600
Batteries, primary—			
Total	52,000	96,000	+44,000
From Great Britain ...	11,000	17,000	+ 6,000
„ United States ...	31,000	63,000	+32,000
„ Germany	3,500	5,000	+ 1,500
„ Denmark	6,500	6,000	– 500
„ France	—	3,500	—
Batteries, secondary—			
Total	60,000	83,000	+23,000
From Great Britain ...	15,500	17,000	+ 1,500
„ United States ...	38,000	55,000	+17,000
„ Germany	5,000	3,000	– 2,000
„ France	1,000	8,000	+ 7,000
Motors—			
Total	122,000	183,000	+61,000
From Great Britain ...	68,000	122,000	+54,000
„ United States ...	29,000	33,000	+ 4,000
„ Germany	13,000	12,000	– 1,000
„ Holland	7,000	9,000	+ 2,000
„ Sweden	2,500	2,000	– 500
„ Denmark	1,500	4,000	+ 2,500
Transformers—			
Total	62,000	91,000	+29,000
From Great Britain ...	40,000	55,000	+15,000
„ United States ...	12,000	23,000	+11,000
„ Germany	6,000	6,000	—
„ Holland	1,000	4,000	+ 3,000
Dynamos and generators—			
Total	28,000	57,000	+29,000
From Great Britain ...	23,000	49,000	+26,000
„ Germany	2,000	3,000	+ 1,000
„ United States ...	3,000	5,000	+ 2,000
Electrical machinery, other—			
Total	907,000	990,000	+83,000
From Great Britain ...	687,000	762,000	+75,000
„ United States ...	95,000	113,000	+18,000
„ Germany	95,000	81,000	–14,000
„ Sweden	4,500	9,000	+ 4,500
„ Canada	400	8,500	+ 8,100
„ Holland	13,000	3,000	–10,000
„ Switzerland ...	4,000	5,000	+ 1,000
Tramway rails and materials—			
Total	62,000	49,000	–15,000
From Great Britain ...	29,000	39,000	+10,000
„ United States ...	23,000	8,000	–15,000
„ Germany	9,000	—	– 9,000
Tramway rolling-stock—			
Total	10,000	10,000	—
From Great Britain ...	6,000	6,000	—
„ United States ...	4,000	3,500	– 500
Engines, oil, petrol and spirit—			
Total	61,000	76,000	+15,000
From Great Britain ...	46,000	54,000	+ 8,000
„ United States ...	12,000	15,000	+ 3,000
„ Germany	700	4,500	+ 3,800
„ Sweden	1,000	300	– 700
„ Canada	1,000	1,000	—
Engines, steam and gas—			
Total	50,000	87,000	+37,000
From Great Britain ...	49,000	82,000	+33,000
„ United States ...	1,000	3,000	+ 2,000

In addition to the above the following goods were imported as "Government stores":—

Batteries, primary—			
Total	2,300	1,300	– 1,000
From Great Britain ...	100	500	+ 400
„ Germany	600	400	– 200
Batteries, secondary—			
Total	4,800	400	– 4,400
From Great Britain ...	1,000	400	– 600
„ United States ...	400	—	– 400
„ France	3,400	—	– 3,400
Heating and cooking apparatus—			
From Great Britain ...	10	—	– 10
„ United States ...	70	—	– 70
Insulators—			
Total (all from Gt. Britain)	6,000	1,000	– 5,000
Motors and parts—			
Total (all from Gt. Britain)	3,000	120	– 2,880
Dynamos and generators—			
Total (all from Great Britain)	21,000	1,000	–20,000
Transformers—			
Total	400	16,500	+16,100
From Great Britain ...	300	15,000	+14,700
„ Germany	—	1,500	—
Electrical cable and wire—			
Total	87,000	27,000	–60,000
From Great Britain ...	60,000	9,500	–50,500
„ United States ...	3,000	—	– 3,000
„ Canada	500	—	– 500
„ Denmark	100	—	– 100
„ Germany	23,000	14,000	– 9,000

	1926. £	1927. £	Inc. or dec. £
Electrical machinery, other—			
Total	311,000	330,000	+19,000
From Great Britain ...	293,000	289,000	− 4,000
,, United States ...	14,000	500	−13,500
Wireless material—			
Total	8,000	700	− 7,300
From Great Britain ...	5,700	300	− 5,400
,, Sweden	1,000	400	− 600
Other telegraph and telephone material—			
Total	188,000	94,000	−94,000
From Great Britain ...	139,000	59,000	−80,000
,, United States ...	5,000	500	− 4,500
,, Sweden	29,000	20,000	− 9,000
,, Germany	10,000	5,000	− 5,000
Electric lamps and lampware—			
Total (nearly all from Great Britain)	4,000	1,000	− 3,000

Hungarian Trade and Industry.

Decline in Electrical Export Balance.

IN our last issue we reproduced the statistics of Hungary's electrical exports and imports during 1927. We have now received a copy of a report prepared for the Department of Overseas Trade by Mr. H. N. Sturrock, Commercial Secretary at Budapest. (Stationery Office, 1s. 6d. net.)

This report reviews the economic situation in Hungary during the past two years, and attention is drawn to the increased stability of industry and commerce following upon the stabilisation of the currency. Trade has returned to normal conditions, most of the weak firms have dropped out, and prices are steady, and are more or less adjusting themselves to international levels. Stocks of manufactured goods are not moving so freely as could be desired, but the local industries are highly protected from foreign competition by tariffs and preferences given in contract work. In the financial section, reference is made to the credit of about £3,000,000 contracted with a British group in December last for the purpose of erecting a large power station for supplying electricity to Budapest and to the State railways. Of this (as we have already reported) £1,000,000 is guaranteed by the British Treasury on the condition that orders for machinery of that value shall be placed in this country.

Electrical Trade.

It is shown that while during the first nine months of 1926 exports of electrical machinery exceeded imports considerably (13.1 million pengo* against 7.0 million), in the corresponding period of 1927 the two items were balanced at 9.8 million pengo. Among the most important classes of goods imported from Great Britain are electrical instruments, which in 1927 were valued at 1.3 million pengo. An appendix to the report gives some details of Anglo-Hungarian trade. Electrical goods are not shown separately, but it is seen that during 1927 Hungary exported to this country 94 quintals of "machinery and electrotechnical machinery," valued at 66,257 pengo, and received 19,842 quintals, valued at 4,591,796 pengo.

The usual method of doing business in most of the lines mentioned as of importance to Great Britain is to appoint a commission agent whose main concern is to make a large turnover, and who may or may not be reliable in his choice of customers. A good agent is invaluable, and often indispensable, but personal acquaintance with his agent and a few leading local merchant firms is worth a great deal to the British exporter. First-hand knowledge of the market can only be acquired by personal visits, which are all too rare. British trade in Hungary is developing favourably, although slowly. If possible, the Magyar language should be used for catalogues, &c., although German is understood by most merchants and agents.

Electricity Supply and Electrical Manufacture.

About 21 per cent. of the Hungarian population is employed in industry. The machine industry, in which electrical manufacturing is included, possessed 172 factories in 1926, employing 30,704 workers. The value of the output was 148,114,000 gold crowns (about £6,200,000). The electric power used for industrial purposes during the first ten months of 1927 was 16½ per cent. more than during the corresponding period of the previous year. There were 184 public power stations in commission on December 31st, 1926; their total capacity was 400,000 h.p., and the value of their output during 1926 was 76,544,000 gold crowns (about £3,200,000). The output for 1927 is estimated to be 15 per cent. higher. There is no water power developed in the present territory of Hungary, and very little, if any, available for power production on an economic basis.

The many small stations now existing are mainly for local use, and are all separate. The only undertaking of importance is that of Budapest. Contracts have been signed in connection with the erection of the first large central station, with a capacity of 75,000 kVA, to be built shortly by a British group at Banhida, a low-grade coal deposit 50 km. from Budapest. This is part of the scheme already referred to.

A large number of factories are engaged in the manufacture of electric motors, transformers and cables. They are reported to have had a fairly good year, and are looking forward to important orders in connection with the large power station and railway electrification scheme mentioned above. The manufacture of lamps and radio valves is an important and thriving branch of the electrical industry. Radio apparatus and telephones are able to compete for export trade, and large quantities of other electrical instruments and small apparatus are manufactured.

An appendix giving particulars of wages in a number of industries shows that an electrical fitter's weekly wages in 1926 amounted to 39.93 gold cr., as compared with 41.28 gold cr. in 1914.

Broadcasting.

In June, 1927, there were 36,877 broadcasting receivers in use in Budapest, and 36,161 in the provinces, as compared with 27,542 and 22,897, respectively, in June, 1926. Budapest is served by the Csepel broadcasting station, which has a rating of 3 kW. A large new Telefunken station is being erected at Szigetzentmiklos on Csepel Island. When completed this will take the place of the present station, and will work on the same wave-length (555.6 metres).

* £1=28 pengo (approx.).

Contractors' Specifications.

An American View.

IN the course of an editorial article on "Better Plans and Specifications," the American *Electragist* (the organ of United States electrical contractor-dealers) says that there are so many causes of unsatisfactory conditions in competitive work that it is difficult to point out any one thing as worse than another. Poor estimating, lack of knowledge regarding costs, lack of backbone, &c., have all been harped on. These are faults of the individual contractor. There is another cause for trouble, however, in this connection for which he is not altogether responsible, but which he might easily help to correct. This is improperly drawn plans and specifications. Many of the very latest buildings are to-day laid out by competent electrical engineers. Generally speaking, such plans and specifications are complete and permit the competitive bidders to estimate on an equal basis. A large volume of work, however, is done in the smaller buildings, which do not offer to engineers sufficient inducement to go out after that class of business. The result is that the plans received by the electrical contractor are either bare as regards the wiring and lighting, or are so "mussed up" and the specifications so garbled as to make it virtually impossible for the contractor to estimate until he has prepared his own plans and specifications. The result is that no two bids are made upon the same work. The successful bidder, it will be found as a rule, offers a less adequate job. The customer, it is true, is going to have his electrical work done for a small number of dollars, but he is saving only at the cost of getting a poorer and less adequate job. Electrical contractors would welcome some way in which competitive work could be offered to them with adequate drawings and specifications, so that all would be bidding on the same job. This might be done in various ways:

(1) The central station might be shown how it can furnish this service and by increasing the copper on the job provide a greater opportunity for future load.

(2) Local contractors' associations might find it very profitable to subsidise an engineer for the purpose of laying out competitive work. This engineer would work with the architects and owners. One local association has hired such a man and other associations are contemplating a similar activity. It is a piece of work which will save the electrical contractor many, many times the expense of the man.

The entire electrical industry is losing business to-day because of improperly drawn plans and specifications. Almost invariably such plans and specifications produce a smaller and less adequate job. They mean less work for the contractor, jobber (wholesaler), and manufacturer, and they serve to prevent the public utility from receiving the maximum revenue from the installation.

The I.M.E.A. in the West Country.-IV.

A Report of the Proceedings and Social Functions of the Annual Convention at Bath.

Domestic Electrification.

(Abstract).

By J. L. CARR, B.Sc., A.M.I.E.E., and J. D. PEATTIE, B.Sc., A.M.I.E.E.

There is a grave danger that the initial development of domestic electricity supply will prove so rapid that, with the existing apparatus and methods, a serious set-back may be experienced later, from which it may take many years to recover.

It is essential that every effort should be made to keep improvements in apparatus and methods ahead of developments in usage.

The temperaments of a sales official and a technical or works engineer are essentially different, but for the successful prosecution of a domestic load policy the closest co-operation between the two schools is of paramount importance.

The principal domestic developments will undoubtedly take place where "all-in" tariffs are available, and a plea is made for a general improvement in the arrangement of service control gear. Even in small houses it may be an advantage to have some distribution boards remote from the service position, and no objection can be raised to a multiplicity of such boards, provided that each is protected by d.p. fuses in a section board. Where an installation has been gradually developed, however, there may be three or more boards, each with a main switch and fuses, at the service position, the wires being bunched at the supply point. In such cases, the various main switches and fuses should be replaced by one switch only, and one of the following alternatives adopted: main fuses and a single distribution board; two-way section board with power and lighting distribution boards; or main fuses, multi-way section board and distribution boards.

One of the greatest difficulties in an electrified house is the provision of a sufficient number of outlets to cater for all classes of appliances, many of them lightly loaded. So far as ordinary domestic use is concerned, excluding circuits for such heavily loaded devices as cookers, the principal types of outlets are: lampholders; two-pin plugs; earthing plugs; and inter-locking switch-plugs. Some effort should be made to produce a standard specification covering ratings of switch-plugs and the dimensions of the plug contacts, so as to provide a universal plug suitable for use with any socket of equivalent rating. For radiator circuits, plugs of a capacity less than 15 A are considered unnecessary. It is too often the

Miss C. Haslett and Mr. W. E. Bush.

Mr. and Mrs. F. A. Newington.

Mr. and Mrs. R. Ayton.

Mr. W. C. P. Tapper, who flew to the Convention.

The Mayor of Bath, the Mayoress (Madam Sarah Grand), Ald. Sir Harry Hatt, and Lady Hatt.

Mr. W. C. Bexon.

In the Institution Gardens.

Mr. J. Snow Huddleston.

case that assistants in showrooms do not appreciate even the most rudimentary points about good lighting practice. The authors consider that one important duty of supply authorities should be the prevention, as far as possible, of the incorrect application of electric lamps and fittings by means of advice, demonstrations, and publicity work. Instruction on correct lines would result in the adoption of much higher standards of interior illumination, with consequent benefit to the supply industry. The mere installation of electric lamps does not constitute "lighting," and due consideration should be given to the scientific aspect.

A system of hiring electric cookers brings the use of this type of appliance within reach of many. The total number of cookers in commission, in a given area, together with the

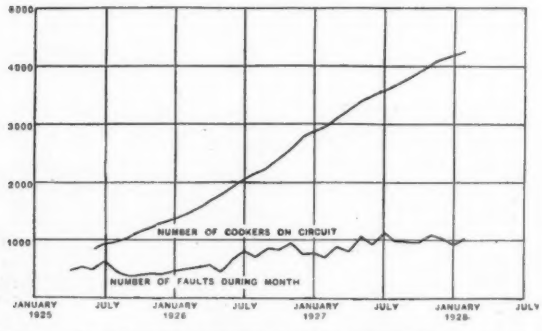
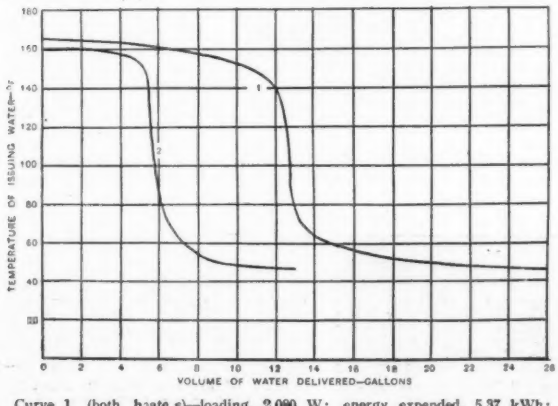


Fig. 1.—Relationship between Cookers Installed and Faults.

failures attended to, including miscellaneous faults on control gear and pilot lamp for the past three years, is given in fig. 1. It will be observed that, as the result of improvements in design and construction and the elimination of weak points during repair or re-conditioning, the number of breakdowns has increased at a much smaller rate than the number of appliances connected.

It would appear that future development in domestic electrification, so far as heating is concerned, should be along the lines of a storage system, energy being supplied at night and the stored heat utilised in the daytime during the coldest periods, with electric radiators for occasional use in the more temperate seasons. Such a system has, however, the serious disadvantages of being costly to install, and of requiring considerable space. The construction of many radiators leaves much to be desired, and it is thought that, with portable models, particularly those which may be moved into such positions as, for instance, bathrooms, the strictest attention should be paid to safety precautions.

The production of hot water in quantity by electrical means is not the cheapest method to adopt. On the other hand, the absence of considerable structural work for storing and utilising fuel efficiently, the immediate availability of the heating agent, and the elimination of dirt and its attendant evils constitute advantages of paramount importance. The usual method of obtaining the domestic hot-water supply from a boiler heated from the kitchen fire is very inefficient, and is practised only because of the necessity of providing a fire in



Curve 1 (both heaters)—loading, 2,080 W; energy expended, 5.37 kWh; temperature of inlet water, 46 deg. F.; temperature of air, 48 deg. F. Curve 2 (upper heater)—loading, 1,050 W; energy expended, 2.40 kWh; temperature of inlet water, 46 deg. F.; temperature of air, 51 deg. F.

Fig. 2.—Water-Heater Test Results.

that quarter, for other purposes, during the greater portion of the year. For electrical methods to prove successful, a radical change in application is necessary. During constructional work, a hot-water installation can be carried out on a preconceived plan, but in most cases the adaptation of existing systems in houses already occupied has to be considered.

Electric water heaters at outlets may be divided into two classes—the geyser type and the storage type. The former type is probably the most efficient method of transferring heat from the resistor to the surrounding liquid, but it possesses characteristics which render it undesirable from other considerations. In the first place, the design of the heaters must be such that the space occupied is small, and the surface exposed to the water great, and accordingly mica-insulated metal-sheathed blade elements are largely used. From their very nature, the life of such elements must be comparatively short, and any interruption in the flow of water results in

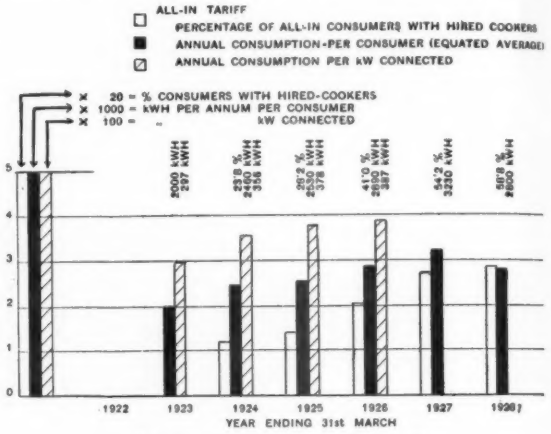

ALL-IN TARIFF
PERCENTAGE OF ALL-IN CONSUMERS WITH HIRED COOKERS
ANNUAL CONSUMPTION PER CONSUMER (EQUATED AVERAGE)
ANNUAL CONSUMPTION PER kW CONNECTED
× 20 = % CONSUMERS WITH HIRED-COOKERS
× 1000 = kWH PER ANNUM PER CONSUMER
× 100 = " " kW CONNECTED
5900 kWH 297 kWH
2538 % 2460 kWH 356 kWH
2962 % 2550 kWH 378 kWH
4170 % 2890 kWH 387 kWH
542 % 3230 kWH
507 % 2850 kWH
1922
1923
1924
1925
1926
1927
1928
YEAR ENDING 31st MARCH

Fig. 3.—Domestic Tariff Results.

their destruction. Complete interlocking arrangements are therefore necessary for satisfactory operation, but in no case examined has it been found that the precautions are adequate and complete.

The storage heater, on the other hand, consists of a well-lagged container, provided with heaters of low loading. Efficient lagging is necessary, in order to keep losses down to a minimum during the long heating and subsequent standing periods. The element, being run at a comparatively low temperature, has a long life and, because of the low loading, may be controlled automatically without difficulty. Further, with local heaters, the absence of long runs of hot water pipes eliminates a serious loss found with some other systems. In order that the external loss of heat may be kept as low as possible, thermostatic control of the heater is desirable. With regard to time-switch control, it may be said that the heavy capital and maintenance charges involved with such an expensive piece of mechanism, together with the cost of additional metering, render a preferential tariff for night heating impracticable in cases where the running charge for current approximates 0.5d.

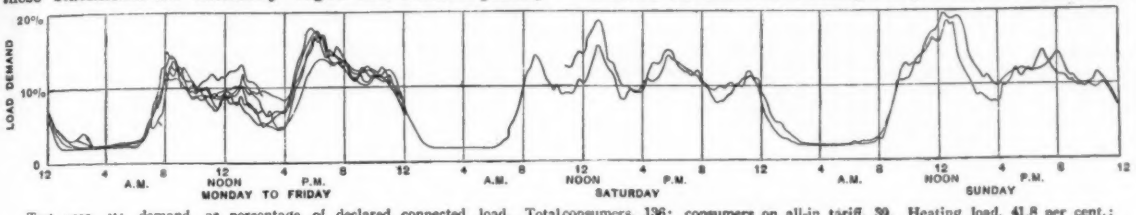
The central-cylinder system is adopted with coal-fired boilers, and a common method of providing for electric heating is to install immersion heaters in the cylinder, with or without the addition of external lagging. This method possesses the advantages of permitting the use of existing hot-water outlets, and of heating either by coal or electricity at will. The principal disadvantages lie in the losses from the tank (although it is admitted that these may be usefully employed in a drying cupboard), and in losses in pipe runs. The provision of a specially designed electrically heated storage tank of large capacity in a central position is technically superior to the latter system, but suffers from some of its disadvantages. The principal point in its favour is that full advantage may be taken of the diversity of the individual hot-water demands, thus permitting the use of a tank of smaller capacity than the aggregate capacity of individual units.

The curves in fig. 2 depict some test results on a water heater consisting of a cylinder of polished copper, provided with a ball-valve cistern, and intended for installation in houses under construction in place of the usual coal-fired boiler—or for use in conjunction with it. It is provided with two heaters, each rated at 1,000 watts, the upper one being intended to give a limited supply of hot water rapidly. The curves show the relation between the temperature of the issuing water and the volume delivered.

The development of wireless broadcasting has been responsible for the production of many battery chargers and eliminators, and these have been made available to the public without any apparent reference to the Regulations of the supply authorities. The fact that the presence of a wireless receiving set in a room alters the electrical requirements, so far as earthing is concerned, does not seem to have been generally appreciated. In rectifiers, transformers, and so forth, all live parts should be completely enclosed in earthed metal cases. In the opinion of the writers, all such appliances should be equipped with three-core circular flex entering the casing through a suitable bush, and the appliances should be used exclusively from an earthed wall socket. So far as eliminators for use on d.c. supplies are concerned, it is apparent that the terminals and connections on the receiving set are in direct electrical connection with the supply, and that the receiver, therefore, comes within the scope of the appropriate Regulations. It follows that, unless the eliminator, receiver and loud speaker are incorporated in one unit, so constructed

that it will pass the strictest examination, d.c. eliminators are unsuitable for connection to a supply system coming within the scope of the Regulations.

During the last few years much has been published regarding the characteristics of the load which can be built up through the extended use of electricity in the home. Many of these statements are extremely vague and some—especially



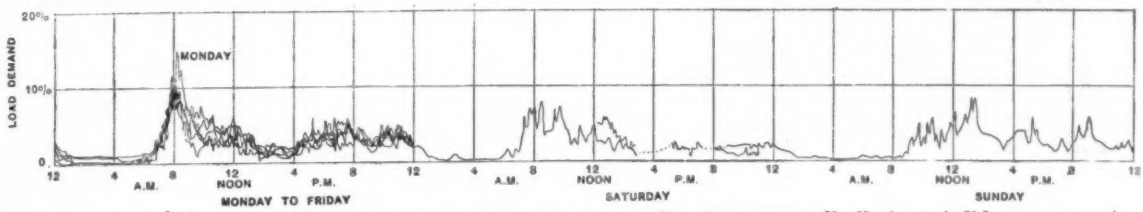
Test area M; demand as percentage of declared connected load. Total consumers, 136; consumers on all-in tariff, 39. Heating load, 41.8 per cent.; cooking load, 33.2 per cent.; lighting load, 25 per cent.

Fig. 4.—Area Winter Load Curves.

those emanating from the enthusiastic sales side of the industry—are of a most optimistic character. Even in what one would regard as more critical studies, one meets such phrases as "the whole of this load is obtained practically without increase of station plant," although, later on, the same author gives a load curve for one house showing at least 2-kW steady load over the system peak, with a note that if the mains had been at home, as they normally were, the steady load would have amounted to 4 kW.

In fixing a tariff, it is essential to so arrange the relation between the fixed and running charges that the necessary return is obtained in the final development of the load. It is well not to underestimate that development. The average annual consumption of 3,230 kWh quoted above is far below the figure reached by many consumers who take fuller advantage of the service offered. A consumption regarded to-day as abnormally high may be quite commonplace in a year or more.

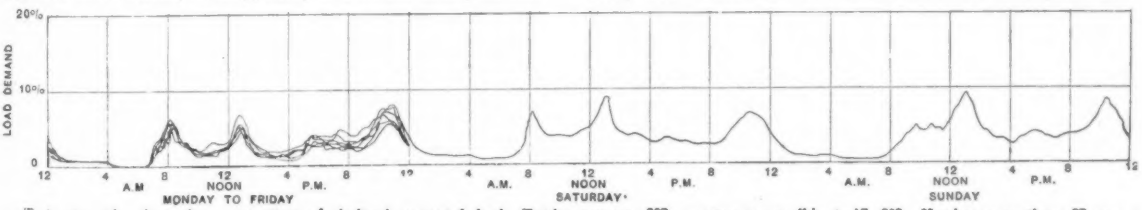
Load curves were taken in several areas, each with a fair proportion of "all-in" consumers. Although in these areas the "all-in" consumers only number about 33.7 per cent.



Test area Q; demand as percentage of declared connected load. Total consumers, 28; all-in consumers, 28. Heating load, 29.3 per cent.; washboiler load, 22.0 per cent.; cooking load, 44.7 per cent.; lighting load, 4.0 per cent.

Fig. 5.—Load Curves for Special Consumers.

In a city in which the authors are interested the bulk of the domestic load has been built up under an "all-in" tariff for all electrical energy used for domestic purposes. The tariff has remained in its present form (20 per cent. of ratable value plus ½d. per kWh) since December, 1923, with an exception during the stoppage in the coal industry. Another factor of great importance in the development of the domestic load was the introduction, in May, 1923, of a cooker-hiring scheme.



Test area P4; demand as percentage of declared connected load. Total consumers, 302; consumers on all-in tariff, 302. Heating connections, 37 per cent.; cooker connections, 41 per cent.; lighting connections, 22 per cent.

Fig. 6.—Area Load Curves for May.

Schemes for hire of washboilers, hire-purchase of appliances and assisted wiring, are now in operation, but have not yet had an opportunity to alter the characteristics of the load to any appreciable extent. The response of the public to these offers, and to propaganda regarding the electric home, has resulted in the load characteristics which are now analysed. From some of the more interesting aggregate annual figures under the domestic tariff still more interesting specific figures may be deduced, as shown in fig. 3. It will be noted that the average annual consumption of the "all-in" consumers has risen from 2,000 kWh in 1923 to 3,230 in 1927, although at the same time the influx of consumers in smaller houses has reduced the average assessed rental considerably. The rise in the average annual consumption is most certainly due to the increasing percentage of "all-in" consumers with hired electric cookers—54.2 per cent. at March 31st, 1927, as compared with 23.8 per cent. at March 31st, 1924. The heavy consumption of these cookers has more than compensated for the decreased consumption of electricity for room heating in the smaller house.

of the total, they account for no less than 81 per cent. of the total connected load. The characteristics of the load will, therefore, be largely determined by the "all-in" consumers. In order to reduce the load curves to a common basis, they have been re-plotted to show the actual load, as a percentage of the declared connected load. The method has proved to be convenient and useful, provided its limitations are clearly recognised. Records were also obtained from individual consumers, but it was found that a very large number of such records would have to be taken before any general results could be arrived at.

The records were taken in suburban areas, where the "all-in" tariff has proved popular. It must be realised that the characteristics are likely to vary considerably for different parts of the country and for different classes of the population. Much of the detailed information published has been obtained in America, where the habits of the people are quite different, and it is not safe to assume that similar results will be obtained in this country.

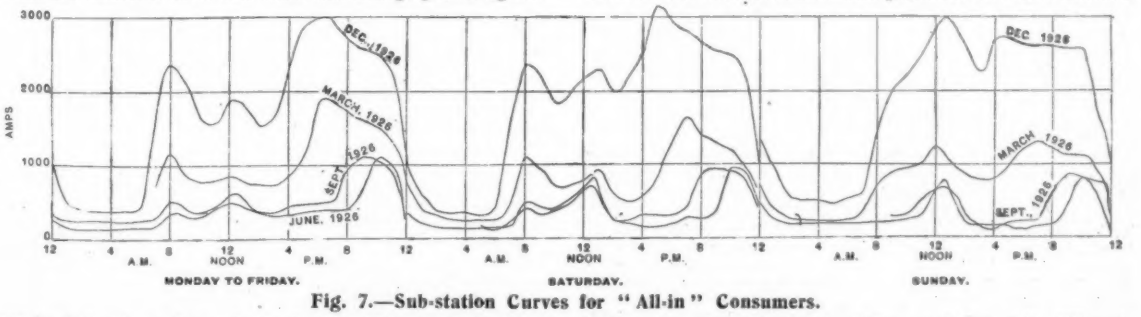


Fig. 7.—Sub-station Curves for "All-in" Consumers.

In the National Electric Light Association Report on Domestic Cooking and Water Heating, 1925-6, the average annual consumption of an electric cooker is given as 1,424 kWh. In the area under consideration the figure is well over 2,000 kWh

per annum. Examination of the normal winter records for various areas shows that the load curves, of which fig. 4 is a typical example, for Monday to Friday are very similar. There is a breakfast peak between 8 a.m. and 8.30 a.m., due to the combined use of cookers, radiators and lights, and in areas with cooker connections there is another peak at mid-day, while in all areas there is a sustained load during the evening between 5 p.m. and 11 p.m.

The load records of a special group of consumers, occupying houses on a Corporation estate, are given in fig. 5. These are not typical of the average "all-in" tariff consumers on the system, and exhibit quite different characteristics. In these houses there is a coal fire in the living room, which is also utilised for cooking and water heating. The result is that, in the morning, the electrical service is used for cooking and heating, giving rise to the breakfast peak at 8 a.m. This load, however, falls off to a minimum between 2 p.m. and 4 p.m., and then rises, to a much smaller sustained load, during the evening, when the coal fire is probably in full use and the electrical service dispensed with. It is interesting to note that, on Monday morning, the washboilers give rise to the highest peak load for the week.

The costs of supplying an "all-in" load will be governed by the proportion of other classes of load on the system. It should, however, be clearly understood that, so far as transmission to residential sub-stations, the sub-stations themselves, and the local low-pressure distribution are concerned, the

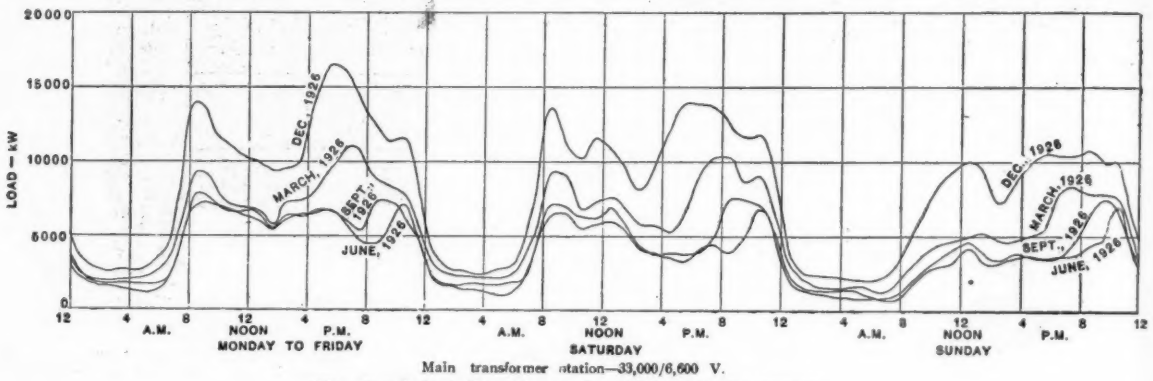


Fig. 8.—Sub-station Curves for "Mixed" Consumers.

domestic load possesses no "off peak" characteristics. It is the predominant load on these parts of the system and they have to be designed to suit it.

It is the authors' opinion that, by encouraging the use of electrical energy in simple radiators at low rates, undertakings are pursuing the line of least resistance and developing a load which has certain undesirable features. It is, essentially, a seasonal load and possesses little diversity. The ratio of the time of probable use of a radiator, by any one consumer, to the time of probable use, by a group of such consumers, is large compared with the same ratio for, say, a cooker element or kettle. The controlling influence—the weather—affects all consumers simultaneously, and a large proportion of the energy used by such appliances is taken from the system at a time when units are most expensive to produce. Fig. 6 shows the load curves for an area for the end of May. With the exception of the peak at 10.30 p.m., the load is almost entirely due to cooking.

Fig. 7 shows the load curves for a sub-station supplying a residential area with a fair proportion of "all-in" consumers, together with shops and ordinary domestic users. It will be seen that the load falls off to a remarkable extent during the summer months, due, for the most part, to the disappearance of the heating load. The load factor on this sub-station is about 19.8 per cent. In fig. 8 the corresponding load curves are shown for a main step-down transformer station supplying a mixed residential, commercial, traction and industrial load. During the summer months, there is a remarkably high weekly load factor, but it will be seen that, again, the heating load appears during the winter months only. The load factor on this station is about 34.8 per cent., which demonstrates very forcibly the beneficial effect on load factor of a combination of loads of widely different characteristics.

The principal deductions from the tests may be summarised as follows:—

(1) Any two-part domestic tariff should be framed so as to bring in the necessary revenue, as far as possible, at all stages of development, more especially in the final stages. (2) The domestic load is the fundamental load on a residential distribution system, including sub-station and intermediate voltage transmission system from the generating station or main step-down station. (3) The domestic load has a certain amount of diversity with other loads at the main step-down or generating stations, and may assist in producing there a load factor of 30/35 per cent. (4) The part of the domestic load due to lighting is unimportant. (5) The part due to cooking is of great importance, and, in a suburban area, is responsible for 1,500/2,500-kWh per annum per consumer. (6) The part due to radiators is also of importance, and must be carefully controlled.

Annual Report.

The annual report of the Council states that the year has been a busy one, chiefly owing to the use members have made of the I.M.E.A. organisation as the central source from which information and assistance can be sought.

The Register totals 246, as against a figure of 231 for last year, a greater annual increase than has been reported for many years. Only about 36 municipal undertakings eligible for membership remain outside the Association. The St. Marylebone undertaking has resigned its membership, having apparently decided on a policy of isolation while accepting the benefits derived from co-operative work.

On the initiative of the Law and Emergency Committee, a deputation, consisting of representatives of all the electricity supply associations, waited on the Electricity Commissioners on November 16th, 1927. With regard to standard railway wayleaves, the Commissioners said they were considering calling a conference of all parties concerned. Cases of delay in connection with wayleave procedure were discussed, and the Commissioners promised to look into the matter.

In connection with the allocation of surplus revenue of electricity undertakings to the credit of the local rates, the Commissioners have been advised that, in order to arrive at the "outstanding debt" of the undertaking for the purposes of the Section, the amount of any sinking fund provided for the redemption of debt should be deducted.

The Law and Emergency Committee has given consideration to the desirability of wiring rules being enforceable, and is in communication with the Commissioners.

The Agreements Committee has drafted a Model Hire-Purchase Agreement to serve as a guide to members contemplating the inauguration of a hire-purchase scheme.

The Bulk Supply Committee has had a very busy year, as many small undertakings have had to take bulk supplies instead of extending their existing plant. The Committee, after reviewing several schemes for a standardised system of charging, realised that until certain definitions of clauses in the 1926 Act were settled by the Electricity Commissioners no further progress could be made in this direction.

Application was, therefore, made to the Commissioners for their definition or explanation of these clauses, but the Committee has not so far received the desired information. During the investigations it was apparent that owing to the high charges made by the various bulk supply companies it would be almost impossible for any small undertaking to give its consumers a charge which would be low enough to enable it to encourage the full use of electricity in its area. The Bulk Supply Committee is now investigating the question of kilowatt charges, coal clauses, and fixed capital charges for the main supply cables, &c.

During the year the Council circulated to its members a statement regarding the work carried out in connection with overhead lines by the I.M.E.A. since 1925.

The I.M.E.A.-E.L.M.A. Joint Committee is considering the price of lamps, especially as affecting small consumers and the relative position of lamps manufactured at home and abroad. It is hoped that the deliberations of this Joint Committee will eventuate in some reduction in the price of British-made lamps.

A point which has caused considerable concern to supply undertakings during the past year is the operation of wireless sets from electricity mains. It is understood that the I.E.E. Committee has now drafted certain regulations which it is proposed to embody in the Standard Regulations of the I.E.E.

Increasing interest in the registration of electrical installation contractors is being shown by supply authorities, particularly by those which have adopted assisted-wiring schemes, and it is gratifying to note that many have restricted installation work to registered contractors.

A deficit of £174 has resulted from the year's working and confirms the opinions expressed at the 1927 annual meeting that the revenue was not now sufficient to cover working expenses. The revised scale of subscriptions came into force on April 1st, 1928.

The I.M.E.A. Exhibition.

As has been the practice at the last few Conferences of the I.M.E.A., an exhibition of electrical apparatus was held at Bath this year. The exhibition took place in the Assembly Rooms, where there were about 36 stands, an increase of half a dozen or so on the number at Buxton last year. There was a half day specially set aside for the inspection of the exhibits on the Wednesday. The exhibition was practically wholly devoted to domestic electrical apparatus.

Messrs. FERRANTI, LTD., had a comprehensive and interesting range of apparatus on view, embodying water heaters, fires, thermostatic equipment, and load levellers. The Ferranti thermal-storage electric water-heating system under control of the load leveller (ELEC. REV., March 23rd, 1928, p. 500), is claimed to afford the ideal means of increasing the domestic load and improving its load factor. The equipment comprises a heavily lagged large-size tank with thermostatically controlled heating elements. The large-capacity storage tank is claimed to be so effectively lagged as to reduce radiation losses to a negligible figure. The water is stored at a temperature of 185 deg. to 195 deg. F. and control of the heat is entirely automatic.

Fig. 1 shows an attractive electric fire exhibited by Messrs. Ferranti. Its reflector is a true parabola of the form which by experiment has been found to give the best radiation efficiency. The surface is chromium plated and highly polished and does not readily tarnish. The losses due to convection and uncontrolled radiation are claimed to be less than those of any other fire on the market. The elements are robust non-metallic rods which have a long life and are both cheaply and easily renewable. The renewing of an element calls for no tools or skill. The fire is compact and portable and can readily be moved from place to place according to where heat may be required at any moment. It is built for a capacity of 2½-3 kW, with a selector switch for half or full heat. It weighs 20 lb. and measures 2 ft. 0 in. long by 1 ft. 8½ in. high by 10 in. deep. An interesting piece of apparatus on this stand was a combined thermo-regulator and temperature switch. This is designed mainly for use with water heaters. Its operation is based on the bi-metal expansion principle, and the mechanism consists of a brass tube through which passes a rod of "Invar" metal. This rod is pinned to the brass tube at the extreme end and extends through a casting on which is arranged an ingeniously simple system of levers to amplify the expansion of the brass tube. A bridge is pivoted to the main casting and carries a single-pole mercury switch connected in the water heater circuit.

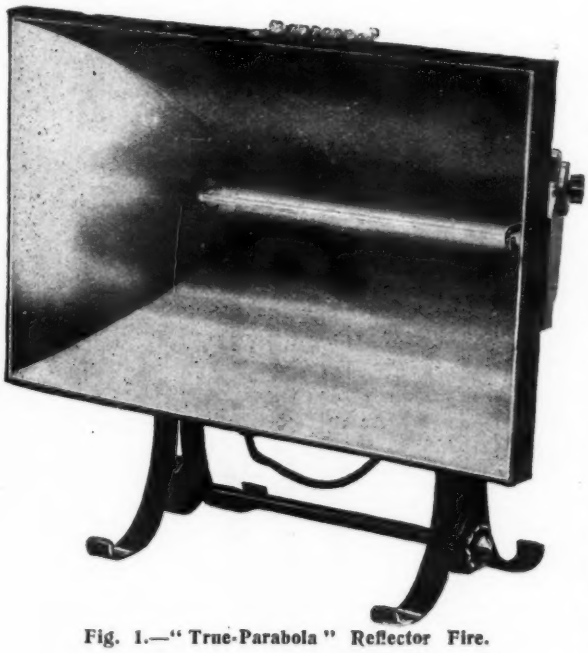


Fig. 1.—"True-Parabola" Reflector Fire.

A feature of an attractive display by Messrs. METRO-VICK SUPPLIES, LTD., was a new flat bar series of electric fires, 1 to 3 kW, finished in semi-bright stove-black enamel, which, we understand, was got out specially to meet the wishes of several important supply authorities for their hiring-out schemes. These also have the advantage of being cheaper than in the other finishes. The new Met-Vick automatic kettle (ELEC. REV., May 11th, 1928, p. 835), was much in evidence and a centre of attraction, as well as the makers' Gyrator electric washer, fig. 2, in which the vigorous action of the offset gyrator rotating backwards and forwards at 96 r.p.m. can be seen through a glass window. Another very useful exhibit was the Cosmos electric wash boiler constructed on the "percolator" principle and remarkably efficient. It is built on substantial lines, the outer casing being constructed of steel with the interior pan and lid of heavy-gauge copper tinned inside.

A small Cosmos cooker, No. 3001, was shown, designed for use in bungalows, small houses, and flats; the oven lining is in one piece, readily removable, with rounded corners, and the boiling plates are of the Cosmos tubular type, cast integral with

Fig. 2.—A Modern Electric Washer.

the plate, which has a loading of 1,000 W and measures 4½ in. square. The griller is situated in the centre of the top element of the oven.

On the stand of Messrs. BURNLEY COMPONENTS, LTD., was seen the "Burco" electric washing and wringing machine. This machine has recently been equipped with several improvements. The general construction is cypress wood, corrugated inside and on the bottom, and all the gears are machine cut and totally enclosed. The washing is done by means of a dolly inside the tub. When the lid is lifted back, the dolly is clear of the tub and the clothes can be easily handled. The wringer, which has 12-in. rubber rollers, has a safety release, a reverse movement, and is constructed entirely of aluminium. Two types of "Burco" electric wash boilers were also shown. One is equipped with immersion elements and has been specially designed to meet the requirements of the Manchester Corporation Electricity Department. This boiler has some unique features in that there are only three tubes for the elements and the external connections are made by means of a Reyrolle 3-pin and scraping earth plug and socket. The other wash boiler has its outer casing and top rim entirely of aluminium, and the general finish denotes a distinct advance on the ordinary galvanised exteriors.

Messrs. A. REYROLLE & CO., LTD., showed, on the stand of Messrs. Burnley Components, Ltd., some examples of their plugs and sockets, and adaptations of these. There was an exhibition board with general samples arranged on it for the purpose of illustrating some of the many varieties of possible mountings, and flexible connectors with fittings at each end (Trailets) were included to show the method of connecting the supply (or outlet) socket to the inlet socket on the apparatus These robust c.t.s. connectors are used as a standard because of their durability, and the adequate grip and means of protection at the point of entry of the cable is worth particular notice. The ease with which standard plugs and sockets can be incorporated in such apparatus is illustrated in two articles shown, namely, a shaving-pot fitted with a 5-A inlet, and an iron which has an inlet similar in size, but specially provided with a locking-ring to prevent the flexible connector from being jerked out. A 3-kW wash-boiler was shown with a 15-A inlet socket. This is of the multiple-heat type, and the variation in the arrangement of the elements is provided for by using 3-pin non-reversible outlets and inlets, with additional earthing connections and a 4-core trailet (three current-carrying cores and an earth-core), so that a suitable switching scheme can be applied to convey the 2-wire supply in the required way to the elements.

A "Reyrolle" metal-clad control board, especially designed for cooker service, completed the exhibit. This is suitable for operation at 250 volts, and consists of a compact cast-iron box fitted with a 30-ampere double-pole double-break switch of the quick-make-and-break type with an external handle. The lid of the box, which may be sealed, is so interlocked that it

cannot be opened while the switch is on, and the switch cannot be closed when the box is open. In addition to the cooker circuit the box contains a 5-A or a 15-A plug and socket for a kettle or other apparatus, with self-aligning fuses of suitable capacity, and a 5-c.p. indicating lamp mounted inside the box behind a red bull's-eye glass in the lid. These boards are black-enamel finished as a standard, and one pattern is depicted in the accompanying illustration, fig. 3

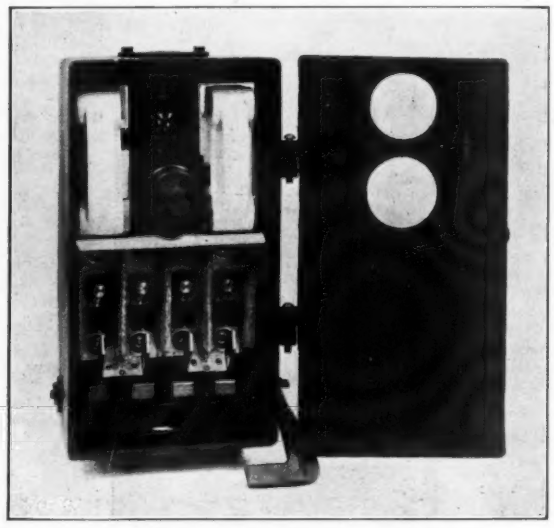


Fig. 3.—Cooker Control Board.

Included in the equipment on show by Messrs. SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., was the Xcel electric safety kettle. The main points about this are that the insulation is steatite throughout and the safety device is improved by an arrangement whereby when the fuse operates the bridge piece drops down a guide rod and cannot return until the new fuse is inserted; consequently, once the circuit is broken, contact cannot again be made until a new fuse is fitted, and there is no possibility of the bridge piece "shorting" to frame. The latest Xcel cooking range, fig. 4, another item on the stand, is fitted with a hot-cupboard door enclosing the space under the hob. Boiling plates are fitted with a special 3-point adjustment for levelling up with the hob and a lining in the holes. The grill is of quite a new design, and a splash plate is fitted in such a manner that the hobplate can be raised without removing it. In addition, the hob is left quite free for wiping down, as the splash plate itself projects a short distance at the back of it. The plate rack is fitted without screws and with three positions for height. The switches and fuses are fitted in a new design of side box with the switch knobs only protruding.

A new "flicker fire" was shown, with realistic effects of moving flames and smoke, produced by the rotation of crinkled glass domes over lamps. The rotation is effected by an extremely ingenious thermal motor, consisting of pieces of magnetic alloy arranged in a circle and passing near the poles of a magnet. The alloy becomes non-magnetic at a very moderate temperature, produced by a small heating element, which is so placed that as each of the bits of alloy passes a magnetic pole it becomes non-magnetic, an unbalanced force resulting which keeps the glass dome in slow rotation. Another exhibit was the Xcel system of low-temperature heating by means of tubular heating elements.

Fig. 4.—Improved Electric Cooker.

The DOWSING RADIANT HEAT CO., LTD., exhibited a model of the "Solarium" electric sun bath. This is designed after the style of the Turkish bath, the necessary lamps being fixed on the sides of the cabinet. The loading is 2,000 W. There are two models of the "Solarium," one for sitting and the other for reclining positions. A feature of this exhibit was a number of cordless electric iron outfits. These have heavy rear terminal contacts which make circuit with suitable contacts on the stand when in the "charging" position. The outfits are built up as 2- and 3-way units. Fig. 5 illustrates another Dowsing exhibit, an automatic sealing-wax heater in polished aluminium. Just sufficient wax for the operation in hand is liberated by pressure on the lever. The capacity is 0.75 pint and the loading 100 W.

Fig. 5.—Electric Sealing-Wax Heater.

The feature of the stand of Messrs. SANTON, LTD., was a new electric immersion heater, the "Santon Circulator." It can be fitted in the top of any existing water tank or cylinder, or supplied ready fitted to tanks for hiring and housing schemes. It consists of a double-shell copper tube about 24 in. long and 2 in. in diameter, with tubular elements arranged down the centre. The apparatus is open at the bottom and when the supply is on the water flows through the tube, being heated during its passage, and out through a nozzle at the top of the circulator, the hot water remaining at the top of the tank. The elements are of nickel-chrome wire wound in porcelain tubes and encased in a metal sleeve. Fig. 6 shows the construction of the apparatus. By removing the bakelite cap on top of the circulator access may be had to the connections, terminals, and elements. The loadings are 2 and 3 kW.

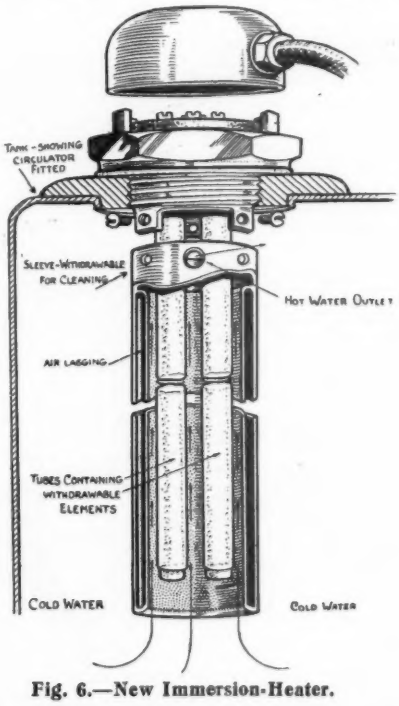


Fig. 6.—New Immersion-Heater.

Another notable exhibit was a "synchronous time switch," operated by a Ferraris motor from a 50-cycle supply; this switch needs no attention, its operation being determined by the supply frequency, and it can be set to operate at any time of the day or night. It consumes only 0.5 watt, and is inexpensive.

The Institution of Civil Engineers.—IV.

Celebration of Charter Centenary, and Engineering Conference.

Domestic Lighting and Heating and their Influence on Load-Factor.

(Abstract.)

By ARTHUR FRANCIS BERRY.

The facts that electric lighting has no rival and is remunerative have stunted development of other uses of electricity in the home. For heating and cooking electricity has rivals, in spite of which electric heating and cooking progress, but not at the rate they should.

Broadly speaking, heating and cooking are essential to increase the load-factor of electricity supply undertakings, which must be low with lighting alone, and when general domestic electrification has been developed efficiently the lighting peak-load will be negligible.

There is a danger, in the absence of suitable propaganda, that consumers will speak of their "electric light" bills when comparing notes with their neighbours as to the cost of electric heating and cooking, and the fact that coal bills and other expenses, which are done away with by an electric service, must be taken into account in order to determine the saving by the use of a complete electric service, needs to be brought home to them. The substitution of one bill for a multiplicity of bills, and the reduction in the number of inspectors and meters for different services, are small additional advantages which the users of electricity secure as a return for improving the general load-factor. Lack of appreciation of the great convenience of electricity often makes it more costly to the user than is necessary. For instance, it is often uneconomical to replace a coal fire by an electric fire in a dining-room fireplace. In that room warmth is required mainly under the table: electricity alone can furnish this, and at a small fraction of the cost of a fire, whether electric or another type.

Electricity should be so installed that it is available exactly when and where it is required. This is the most economical plan, and conduces to the greatest appreciation of the convenience of electricity. Few engineers would replace a boiler and engine by one large motor when electrifying a works or factory, and in the same way a candelabrum and a coal fire should rarely be replaced by an electrolier and an electric fire. The load-factor of supply can be greatly increased and money saved by developing domestic electrification on more thoughtful lines. A good load-factor is the result of incessant use, and such use means that the service is found to be invaluable.

The maximum effect of domestic lighting and heating on the load-factor will be secured only when appliances in great variety are supplied on easy terms, and when a desire for the convenience afforded by electricity has been created in the minds of housewives.

The author is indebted to Mr. W. A. Gillott for the following example of the influence of lighting and heating on load-factor. It is assumed that a town has a population of 100,000, with an average of five persons per family, inhabiting 20,000 houses, of which 20 per cent. are equipped for the use of electricity. It is also assumed that each of these houses has six or seven rooms, and is fitted with a cooker (6 kW), three "Sunray" radiators (2 kW), a hot-wire electric fire (2 kW), a wash-boiler (3.5 kW), an electric iron (0.5 kW), a kettle (0.85 kW), a toaster (0.5 kW), a water-heater (2 kW), a system of lighting (0.5 kW)—a connected load of 17.85 kW per house, making a total of 71,400 kW.

The water-heater would consist of two heating units, each of 1 kW, one directly connected to the main without a meter, but controlled by a time switch, and the other for use by hand control. The first of these would be charged at, say, 0.4d. per unit, assuming the cost of coal at 0.2d. per unit, for, say, 10 hours each night, at a total cost of £6 1s. 8d. per annum, and would provide a constant night-load to the station of 4,000 kW. During the day the general domestic requirements would be met by hand control dependent on the needs of the household, and from observations it has been ascertained that the average demand would vary from 1 to 1.5 kW per house. Therefore, in view of the fact that the heating of water would be done principally during the night, an average demand of 1.3 kW per house may be assumed, equivalent to 5,200 kW maximum demand for a connected load of 71,400 kW. The most important feature of this load is that the highest peak occurs during the winter on Sundays, when the station is best able to deal with it.

The estimated annual consumption for 4,000 houses is 21.8 million units, the majority of which would be used during the off-peak periods of the day, and the consumption at night of the water-heating load would provide an annual output of 36.4 million units for a maximum demand of only 5,200 kW, equalling approximately 80 per cent. load-factor on demand, or approximately 20 per cent. of the connected load.

To stimulate the ordinary domestic day load, it is suggested that a tariff upon the lines of £8 per annum per kW of lighting installed, plus a charge of ¾d. per unit, would be sufficiently attractive to encourage that class of business upon the scale mentioned.

The cost at the rate of consumption given above would be as follows:—

Annual fixed charge	£4	0	0
5,450 units at ¾d.	17	0	8
Water-heating charges	6	1	8
	£27	2	4

With a house of this size very little, if any, other form of fuel would be needed. Taking the cost of coal, firewood, matches, gas and electric light for a house of similar size, and comparing such cost with that of a house using electricity only, it will be found that the electric household compares very favourably upon cost alone; and, taking into consideration also the savings secured, this application of electricity for domestic purposes becomes a sound proposition for users.

Discussion.

The Chairman (Col. R. E. CROMPTON, C.B.) said Londoners, at any rate, would say that this was the most important question that could come before them, because the whole question of their supply depended on what was called filling up the demand of the peak hours, and Mr. Berry had himself done a great deal towards solving the problem.

Lt.-Col. W. A. VIGNOLES (British Electrical Development Association) said he took it that the 36.4 million units referred to by Mr. Berry was the total, but if it was the total less the water-heating load it would be interesting to know that. If that was the case, it appeared to work out at 0.2d. Was the price for water heating taken as 0.4d.?

Mr. BERRY said that that was the basis.

Col. VIGNOLES, continuing, said that to improve the load factor of an electricity undertaking, what was required was simply to sell electricity for purposes other than lighting. There was no purpose for which electricity could be used which would not have the effect of improving the load factor, with one exception. Apparently, under certain conditions, there was a danger that electricity used for heating might cause a peak load during a cold snap in the winter, which peak might last only for a very short time, say a day or so. That, however, was only likely to occur where the price for electricity was on the high side. If the price was sufficiently low it seemed that electricity would be used continuously throughout the winter for heating purposes. There were two ways of using electricity whereby the load factor could be improved. While the heating of houses was necessarily confined to the cold period, the heating of water was required all the year round, and its application was likely to be highest in the summer months, because, in the colder part of the year, under present conditions, people used existing stoves or coal fires or coke boilers for heating the water, and these were also used for the warming of portions of the house. There was also possibly a new application of electricity for domestic use in England which applied specially to the summer months, namely, for refrigeration. Mr. Berry, in dealing with the question of cooking, said that the development was not as rapid as it should be, and that was true. His own Association had obtained recently figures from some 200 undertakings showing that there were about 50,000 electric cookers in use in those undertakings. This, of course, represented quite an appreciable load, and accounted for a good many million units in the year, but that number of cookers represented only about 1.25 per cent. of the houses in the areas concerned.

Mr. F. W. PURSE (West Ham) said he could not agree that when general domestic electrification had been developed efficiently the lighting peak-load would be negligible. Taking the load as a whole he did not think we should ever find the lighting peak-load negligible. He thought we had not yet appreciated what was going to be the effect of the peak-loads for heating and cooking. In his own district electric cooking was going ahead very rapidly, but when he had particulars of voltage drops, and when his mains department got out estimates for maintaining the pressure, involving a transformer kiosk in every road, it began to make him think. If prices were too low there would be nothing to play with at all, and he would be up against the capital charges on the main. Therefore it was necessary to be careful. If the Commissioners' last return on coal consumption was studied it would be realised that it was not the load factor which specifically affected the cost. There was an undertaking given in that return which had a load factor of 42 per cent., but its coal consumption was 5.39 lb. per unit! Why? Because its output was only 2,000,000 units. Again, look at the undertaking which had the lowest coal consumption per unit. Actually the lowest was Manchester, which, with a load factor of 53

per cent., consumed 1.33 lb. per unit. The one next to that, where the load factor was only 24 per cent., had a coal consumption of only 1.71 lb. per unit. What was the reason for this low coal consumption? It was because the output was as high as 133 million units. His contention, therefore, was that it was the load factor, combined with increased size of output, and not the load factor alone, which counted. With regard to the example of 0.4d. per unit, mentioned in the paper, they might have looked forward to that figure under the old control, but he was a little doubtful about it under the Central Board's scheme. Some station engineers had had supplied certain figures of an approximate cost estimated at 0.25d. per unit—high pressure—plus the fixed charge. If they studied the 1926 Act, they would find that, after ascertaining the maximum demand, the more the summer peak was filled up, the greater would be the average maximum demand for which they had to pay. According to the maximum demand system under the Act of 1926, the highest demand registered in any month was taken and carried on to successive months until another higher maximum was reached. If we assumed a unit of 100 for the winter peak, and if the year began on April 1st, the load would probably have dropped down to 70, and would go on dropping down until June to about 50. In that case the average maximum demand to be charged under the Act would be 70 to 80. It would be lower, the lower the load factor of the undertaking. But if this peak was filled up a steady figure through the year was obtained, the average demand on which the undertaking would have to pay would be 100 instead of about 75. The more the load factor was increased the greater would be the average maximum demand to be paid upon to the Central Board.

Mr. J. W. MEARES said there was no question that the raising of the load factor and the spread of the capital charges was one of the crucial points in electricity supply. He had been living in a place where there was water power and where the load was highly developed. The load factor was 55 per cent., and the costs, consequently, on a very small undertaking, were exceedingly low. Power for water heating was obtained at the equivalent of ¼d. per unit. The question was being raised in another meeting of the Conference of water heating in a different way—namely, thermal storage for levelling up the load factor on tidal power.

Mr. A. H. DYKES said that to develop the cooking load in residential districts there must be a two-part tariff. The author suggested that the domestic day load should be stimulated by a tariff upon the lines of £8 per annum per kW of lighting installed. In other words, he based his standing charge, not on the kW loading for cooking and other purposes, but simply on the lighting load. That was interesting, and he had looked into one or two of the stations where the two-part tariff was at work. There was one station which did practically base it on the lighting load. That station, which supplied Leatherhead and a widely scattered district, where the mains in some cases had to pass over miles of common, was providing electricity something like eighteen months ago at a price for lighting of 10d. per unit. When it was decided to offer a two-part tariff it could not be based on the ratable value of the houses, because the rating differed so much in the different districts; therefore it was based merely on what had been the previous consumption for lighting. He took out the number of units each house had had, taking the price at the rate of 10½d., and decided that the follow-on charge was to be 1½d. That amount was deducted and the difference was made the standing charge. In one small section there were 19 consumers who adopted this tariff. The load was 16.6 kW for lighting, 73.5 for cooking, 40 for heating, and 21 for other purposes, a total of just over 150 kW, which worked out at 8 kW per house. The units consumed by these houses before this tariff was offered amounted to 4,280, for which the people paid 10d. per unit. Last year, under this tariff, they consumed per house 2,840 kW. instead of 225, as under the old arrangement, and the figure charged them was £9.2 per kW. Considering that this was a district where the costs of distribution were very high, he did not think the figure was at all excessive. But the interesting point was that although the price had now been reduced to 8½d. for the flat rate for lighting, a number of the consumers approached the clerk of one of the districts just recently and complained that the prices the company were charging were too high. The secretary took with him the list of the consumers, and it was shown that the average price paid by these consumers was 2.19d. per unit, and in this area that was about the average price people were paying for electricity when they chose to use it for more than a few lights which they turned off and on as quickly as they could.

Dr. J. W. LIEB (New York Edison Co.) remarked upon the very different conditions in the United States. In the lower part of California and Florida freezing point was never reached, and the question of household heating there was quite different from what it was in the Eastern States, where very low temperatures were reached. Of course, they were very much interested in the improvement of the load factors. Originally, when the business in the States was started, there were load factors of 18-20 per cent., but in the Metropolitan areas they had improved to 38 and 40 per cent. They were rising slowly, but surely and satisfactorily, and, by supplies to street railways, trunk-line railways and industrial vehicles, they were adding to their factors. Such supplies were proving applicable and economical in New York, Chicago, Boston, and other great cities where there was a very active street traffic, and where fleets of delivery trucks of 40 to 100 belonged to one concern. But the improvement of the load factor was uphill work, and they were doing all they could by tariffs to develop off-peak loads, to encourage and stimulate the use of electrical appliances, and heating loads, generally speaking. In New York there was nothing in the nature of a seasonal off-peak. There was, however, an off-peak or valley load during the day. Two rather interesting conditions affected this matter. There was quite a pronounced improvement, in the residential load factors on the system, as a result of broadcasting, due to the number of people who sat at home into the small hours listening in. Again, there was a great improvement in the load factor as a result of refrigeration.

Miss HAZLETT (Women's Electrical Association) said Mr. Berry had touched upon the two main points in regard to the development of the domestic load—namely, the education of the woman consumer and the need for a good service. The average woman was very ready to find any method which would lighten her household tasks. But in her mind there were two definite obstacles. In the first place, she had always believed that electricity was expensive, and she continued to believe this even though she might be living in a district where it was comparatively cheap. Her second difficulty was that she was afraid of it. Women had always been brought up to believe that anything which had to do with mechanics and tools was beyond their intelligence, and here they were being asked to run their houses with a new kind of tool. The engineer of the future must realise that in regard to the question of domestic electrification there were two distinct sides, one of them the engineering side and the other the housecraft side.

Dr. S. Z. DE FERRANTI said there was one thing in the paper which he did not agree with at all. Mr. Berry spoke about water-heating with a constant load, and having another element in the water-heater which could be put on by hand. He did not think that was admissible at all. Such gear in a house must take care of itself entirely. He had installed a Swiss water-heater with an automatic switch, and nothing had been heard about it since its installation; it had always given a plentiful supply, and it had met the need of people who wanted simply to do no more than turn a tap and get their supply. People did not want to do anything electrical; whether the control was worked by a time switch, or by what were called load limiters was a matter for choice. Probably both systems were good, and might be used with advantage in the same district. Mr. Berry emphasised the importance of storage, and any demand which involved storage was all to the good in the way of cheapening the cost at which electricity could be supplied to the public. He was sorry that so important a subject should be crowded of necessity into so short a time. It was one not for one short meeting, but for many meetings.

Mr. A. F. BERRY, in reply, said he was entirely in sympathy with Mr. Dykes's idea about rates. The diversity of uses of electricity in the home had been referred to by several speakers. That was why he had stressed the beauty and comfort and the æsthetic side generally of electricity. Women must be got to make larger uses of electricity. Let the women keep their husbands at home and awake by electrical consumption! Col. Vignoles had spoken of 50,000 cookers in this country; that would be a respectable number for such a town as Leicester, but for the country generally it was nothing to shout about. In Brighton alone they had between 50,000 and 60,000 gas cookers. Mr. Purse knew as well as anybody that figures could prove or disprove anything, and he handed him over to the tender mercies of the Commissioners. He was sorry that the smaller side had not been taken up more in this discussion, the diversity factor in the house itself, the facility to switch from one thing to another, but he was not inclined to agree with Dr. Ferranti that people would do nothing by hand. The supply engineers dictated as a rule what might or must be done in this respect, and people would take a little trouble in a house for the sake of comfort and convenience, and especially for the sake of minimising cost.

The CHAIRMAN (Col. Crompton), in thanking Mr. Berry, said it was rather hard for himself, the inventor of the term "load factor," to sit and listen and not say a word in reply, but a discussion could be managed somewhere else. He was one of those individuals who thought accumulator storage had not altogether disappeared; it might be useful in improving the load factor nowadays. One thing to do was to get a thoroughly good "hot spot" cooker, which could have only a few watts on all day, but whenever heat was required it could be obtained.

Switchgear Research in France.

A project was recently drawn up by the Etablissements Merlin & Gerin, of Grenoble, in conjunction with the Polytechnic Institute of the University of Grenoble, for the establishment of a special laboratory for research work in connection with switches and circuit breakers for use on high-pressure transmission systems at from 12,000 to 120,000 V.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

Pillar-type Battery Chargers.

A recent production of Messrs. WRIGHT MOTORS, LTD., Century Works, Halifax, is a neat and compact type of battery charger for which Mr. H. Hodgson Wright, M.I.E.E., is the patentee. This pillar charger is built in five types and four sizes on the vertical-spindle principle, and consists of a single-

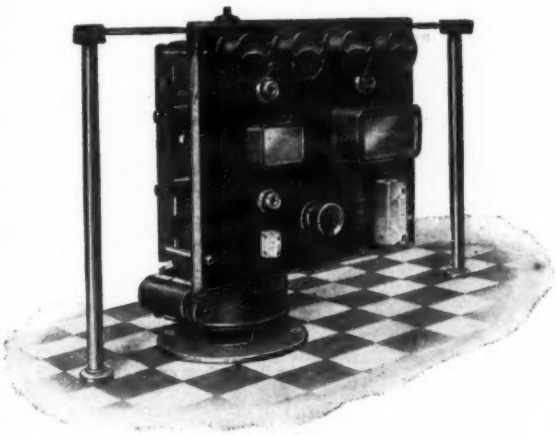


Fig. 1.—Pillar-type Battery Charger.

two- or three-phase squirrel-cage motor below, directly coupled to a d.c. generator. The rotor and armature are built on one shaft and rotate in two ball bearings, thus avoiding all question of correct alignment and bending strains, and resulting in a highly efficient arrangement. A switchboard is fixed to the charger and fitted with all the necessary meters and switchgear. The starter or main switch is fixed to the base of the charger and permanently connected ready for starting. Busbars are supported by two insulated brackets from which the flexible leads are taken to the terminals of the battery. The outfit includes the necessary number of rubber-insulated flexible leads and battery clips. Fig. 1 shows the arrangement of the apparatus.

A Small Circuit Breaker.

A small circuit breaker, suitable for use on a.c. or d.c. circuits up to 250 V, has just been placed on the market by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. It consists of a s.p. switch fitted with mechanism to break an electrical circuit automatically in the event of

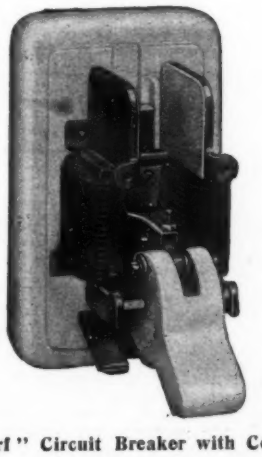


Fig. 2.—" Dwarf " Circuit Breaker with Cover Removed.

excessive overload or a " short-circuit." It is claimed to be particularly suitable for the control of electric domestic appliances and for protecting testing and charging circuits. Features of the " Dwarf " circuit breaker are a strong vitreous-porcelain base with a moulded ebonite cover. The break is fitted with magnetic blow-outs with easily renewable fixed and moving contacts. Connections are made to screwed stems at the back of the instrument. The apparatus is available in four sizes, having normal capacities of 2, 4, 6 and 10 A, with overload calibration in each case of 100 per cent. above the normal capacity. The overall dimensions of the apparatus are 4 in. by 2¼ in. by 5¼ in., and the weight is 21 oz. Fig. 2 shows the breaker with its cover removed. Since the preparation of this note we have received particulars of an almost identical unit which is supplied by Messrs. RUNBAKEN MAGNETO CO., Tipping Street, Ardwick, Manchester.

A New Flame-proof Coal Drill.

The CONSOLIDATED PNEUMATIC TOOL CO., LTD., has recently introduced a useful piece of electrically operated mining equipment in the form of a flame-proof coal drill, fig. 3. In this apparatus the motor is totally enclosed and designed to withstand internal explosion pressures without permitting the flame to pass to the outside of the motor or switch enclosure. An interesting point is the external cooling arrangement which ensures a cool-running motor; a strong current of air is blown between the inner gas-tight casing and the outer shell by means of a fan running at the armature speed. Among other constructional features may be cited the method of fastening the covers, which provides that the accidental omission of screws cannot leave an opening through which gas may penetrate. A plug attachment is fitted to the switch case, the socket portion being attached to the cable. The points of the plug are suitably protected, and the use of caps with both socket and plug parts prevents the entrance of water and dirt. The plug and socket form a safety device which prevents the machine switch being closed until the locking ring is screwed home; if the locking ring is removed or works loose the switch is automatically opened. The machines are made for use with suitable stands and, in the case of the a.c. machines, they can be mounted or unmounted. The larger sizes give a drilling speed of approximately 30 in. and 24 in.

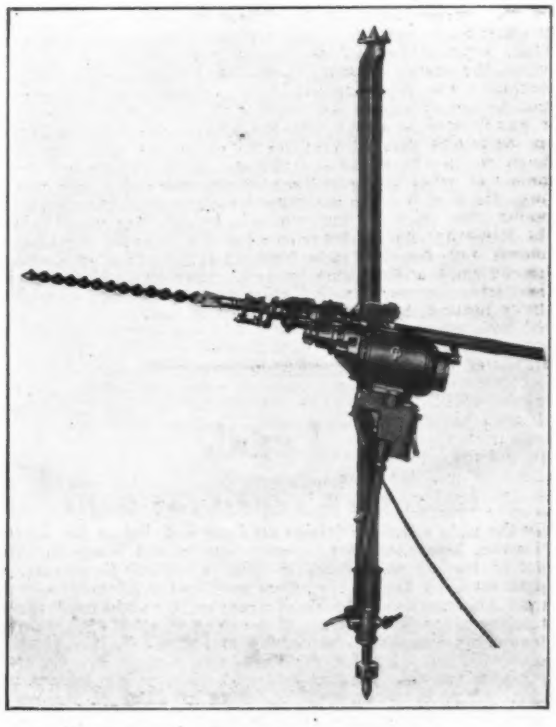


Fig. 3.—Flame-proof Coal Drill.

per minute, though the speeds are subject to variation according to the material under operation. The drill is covered by the certificate of the University of Sheffield Mines Department. The smallest and lightest machine developed is a.c., 2- or 3-phase, with flame-proof switch, capable of drilling at the rate of 12 in. per minute, and weighing 49 lb.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The New Speaker.

Capt. E. A. FITZROY, the Unionist member for Daventry, has been elected Speaker of the House of Commons in succession to Mr. Whitley, who has resigned.

Electricity Charges in Cheshire.

On June 21st, Mr. AMMON asked the Minister of Transport whether he had received any complaints relative to the charges for electrical energy made by the Electrical Distribution of North Wales and District, Ltd., in the Haslington area of Cheshire; whether he was aware that the existing scale of charges inflicted hardship on those unable to pay the subscription terms laid down by the existing Order; and whether he would take action to secure a revision of the present charges and conditions upon the expiration of the Order.

Colonel ASHLEY said he had received one such complaint. The existing scales of maximum charges were prescribed by an Order approved by Parliament in December, 1926, and he had no power to entertain applications for the revision of those charges until December, 1929. The question whether the present maximum charges should then be revised must depend upon the circumstances of the time.

Bournemouth Electricity Charges.

On June 21st, Mr. A. ALEXANDER asked the Minister of Transport whether he had taken any action with regard to the petitions which he had received from consumers in the Sandbanks, Canford Cliffs, and Parkstone districts of the area covered by the Bournemouth and Poole Electricity Supply Co., Ltd.

Colonel ASHLEY said that the Electricity Commissioners had communicated with the company, and so soon as the company's reply had been received he would consider what further action should be taken in the matter.

Overhead Line Inquiry.

On June 21st, Captain R. HENDERSON asked the Minister of Transport if he would state the result of the inquiry into the application for permission to provide, by means of overhead lines, electricity to Clifton Hampden and the neighbourhood.

Colonel ASHLEY said that the electricity undertakers had been notified of the conditions upon which he was prepared to give his consent to the lines referred to.

Scientific Treatment of Coal.

During a debate on the vote for the Department of Mines on June 21st, several members urged the Department to press forward with the scientific treatment of coal, particularly low-temperature carbonisation, and to co-ordinate the power production of the country.

Sir P. CUNLIFFE-LISTER, the President of the Board of Trade, in reply said that with regard to pulverised coal, they had gone further than the experimental stage. There had been launched, if not actually at sea already, one cargo liner, which was doing long voyages with a new complete installation of pulverising plant to burn pulverised coal. He was inclined to think that the best advance for the extended use of coal would come from the increased used of pulverised coal, rather than from the distillation into oil. They had had many disappointments over the distillation process, but they seemed to be going straight ahead with pulverised fuel.

Legal.

Partners Sued by a German Cable Company.

IN the King's Bench Division on June 21st, before Mr. Justice Hawke, Messrs. Charles Coveney-Cousins and Roger N. Ellis, lately trading as Cousins & Ellis, electrical merchants, at Balham High Road, S.W., were sued by the Rheinische-Draht und Kabelwerke G.m.b.H., of Cologne, wire and cable manufacturers, for £300, balance of the price of goods sold to defendants, who dissolved partnership in November, 1927.

Mr. WHITE, for the plaintiffs, stated that Mr. Coveney-Cousins had submitted to judgment. Mr. Ellis's defence was that plaintiffs had released him from his share of liability on payment of £100. This was denied.

Defendant Ellis said that about the time of the dissolution of his partnership with Mr. Coveney-Cousins he had had an interview with plaintiffs' London representative, who agreed to release him from further liability to the German company on payment by him to the company of £100, which was paid.

Mr. COVENEY-COUSINS said that it was agreed that he should be solely responsible for the firm's indebtedness to the plaintiff company on condition that Mr. Ellis paid £100.

His LORDSHIP decided that the £100 was payment as plaintiffs said, on account, and was not made on condition that Mr. Ellis be released from liability. There was nothing from which it could be implied that plaintiffs' representative had authority to release Mr. Ellis. He therefore gave judgment for the plaintiffs for the amount claimed, with costs.

British Thomson-Houston Co., Ltd., v. Davey & Coldwell.

IN the Chancery Division on June 19th, a motion for judgment by the British Thomson-Houston Co., Ltd., against W. Davey and T. Coldwell, of Leeds, for an injunction restraining infringement of their leading-in wire and gasfilled lamp patents, came before Mr. Justice Tomlin.

Mr. TOOKEY, for the company, said that Davey had sold infringing lamps and after service of the writ he removed to Coldwell's premises at Stanley Road, Leeds, other cases of infringing lamps, which he would sell if not restrained. He asked for a full order against Davey and an order for delivery up against Coldwell.

Counsel for the latter said that he simply stored the goods for Davey, not knowing what they were.

His Lordship made the orders as asked, but made no order for costs against Coldwell.

Proposed Sub-station in a Churchyard.

THE Judicial Committee of the Privy Council has dismissed the appeal of the rector and churchwardens of the parish of St. Nicholas Acons, City of London, against an order refusing sanction to an agreement with the City of London Electric Lighting Co., Ltd., permitting the company to extend a transformer chamber into a disused churchyard.

Correspondence.

***Correspondents should forward their communications* as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Alternating-current in Three-core Mains.

Mr. H. M. Price appears to be mistaken in his notions regarding the loading of three-wire d.c. mains utilised for a.c. supply.

His suggested method of loading the blue phase and neutral inductively and balancing this load by connecting only non-inductive load to the red phase and neutral will not reduce the load on the neutral, but will increase it, because the phase rotation is R W B=W R B=B R W, and of the two phases B and R, B is the leading phase.

This is represented in fig. 1, where OA represents the current in the red phase, with 1.00 p.f.; OB represents the current in the blue phase with 0.5 p.f. (lagging); OC represents the resultant of OA and OB; and OC- represents the current in magnitude and direction in the neutral, which in this case is equal to phase current multiplied by $\sqrt{3}$.

From this it is evident that the phase which is loaded non-inductively must be the leading phase.

If the blue phase is loaded to, say, 100 amperes non-inductively, and the red phase to 200 amperes inductively with a p.f. of 0.5, this condition will be represented by fig. 2, where

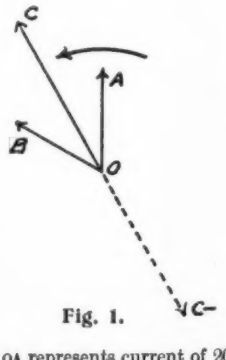


Fig. 1.

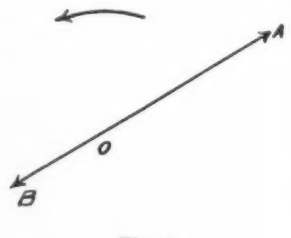


Fig. 2.

OA represents current of 200 amperes at 0.5 p.f. (lagging) in the red phase; OB represents current of 100 amperes at 1.00 p.f. in the blue phase. OB will also represent the current in magnitude and direction in the neutral.

Apart from the difficulties which would arise in attempting to balance the network equally, the above conclusions indicate that in loading-up the lagging phase to lessen the load on the neutral wire, considerable wattless current would be carried in the lagging phase, thus restricting its useful load-carrying capacity.

A. J. W.

June 24th, 1928.

Selected Station Accounts.

"Accountant" has set out clearly the way in which the "Costs of Production" have to be made up to give the charge against the Central Board; but there remain some questions on which his opinion will be useful.

The "Costs of Production" include capital charges—interest and/or dividend, loan repayments and/or depreciation allowances—which will generally have to be carried to the General Accounts as Net Revenue, available for meeting such charges.

Hence a separate "Station Revenue Account" should show a balance representing the sum of those items, whereby it is linked with the owners' general accounts. The question is how to show the connection in the clearest way.

A General Revenue Account seems possible, in which the working costs of the station will appear on one side, as part of the total expenditure, and the larger sum charged to the Board on the other as one item of receipts. This would bring the items mentioned above as capital charges, into the general balance of the Revenue Account which is carried to the Net Revenue Account for disposal.

In considering any standardised form of accounts it must be remembered that a selected station may be used by the Board as a peak load station with an output below the owners' requirements. The Board in such cases still has to meet the capital charges, but the owners may have to pay the Board more for their supply than they can charge the Board for the station output. Further, the "statutory form of accounts" has to be adhered to.

Perhaps "Accountant" will write a little supplement to his useful article dealing with these points?

Henry M. Sayers.

London, *June 23rd*, 1928.

Super-pressure Cables.

I have read with interest Major A. M. Taylor's letter in your last issue, in which he discusses the report in the *Electrical Power Engineer* of my recent lecture before the London Technical Group of the Electrical Power Engineers' Association.

Major Taylor appears to have supplied in his letter the answer to the questions he has raised, since I quite agree that my attention was in this particular paper concentrated, though not exclusively, upon cables for 33,000 volts and 66,000 volts (where the advantages of "reduced stress types," including intersheath types, are, as Major Taylor points out, decidedly less marked than theoretical considerations would indicate to be the case at 190,000 volts, say), which are within the realm of practical politics at the present time.

N. A. Allen.

London, *June 25th*, 1928.

O.L.A. Visit to All-Electric Farm.

A number of requests have been received from non-members of the Overhead Lines Association, asking permission to join the party that is coming to my farm on July 18th next. It has therefore been decided not to make the visit an exclusive one; any of your readers who would care to come should communicate with the Hon. Secretary Mr. Theodore Stevens, 50, Lincoln's Inn Fields, London, W.C.2, who will send them particulars of the arrangements.

By the way, a novel form of overhead-line construction will be on view, the cost of which, as a two-wire line, is only about £66 per mile.

R. Borlase Matthews,
President, Overhead Lines Association.

East Grinstead, *June 25th*, 1928.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1926.

30,669. "Electrical heating appliances." American Resistor Corporation. December 3rd, 1925. (262,161.)

1927.

2,676. "Circuit arrangements for selectors for remote-control systems, telephone systems, and the like." F. Aktiendorff. January 29th, 1927. (291,487.)

2,906. "Apparatus for electrically transmitting images or pictures." Siemens & Halske Akt-Ges. June 1st, 1926. (272,167.)

5,246. "Thermionic valve circuits." A. H. Midgley. February 24th, 1927. (Cognate applications 27,299/27 and 27,300/27.) (291,493.)

5,289. "Electromagnetic devices." A. Wright. February 24th, 1927. (Cognate application 34,721/27.) (291,494.)

5,503. "Variable-speed electric alternating-current motors." W. A. Boulting and A. Williams. February 28th, 1927. (291,499.)

5,727. "Telephone systems." J. E. Pollak (Associated Telephone and Telegraph Co.) March 1st, 1927. (291,510.)

5,760. "Loaded telephone circuits, and particularly the reduction of cross-talk therein." Standard Telephones and Cables, Ltd., A. D. Blumlein, and J. P. Johns. March 1st, 1927. (291,511.)

5,880. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., J. E. Ostline, T. R. Rayner, and T. P. Preist. March 2nd, 1927. (291,515.)

5,890. "Cable and the like telegraphs." W. S. Smith, N. W. McLachlan, and W. G. R. Jacob. March 2nd, 1927. (291,516.)

5,929. "Electric fuses." V. Hope. March 3rd, 1927. (291,518.)

5,930. "Oil-immersed electric fuses." V. Hope. March 3rd, 1927. (291,519.)

5,957. "Apparatus for transmitting and receiving speech or sound or other vibrations." E. P. Harrison. March 3rd, 1927. (291,521.)

6,014. "Diaphragms for acoustic instruments." R. French. March 3rd, 1927. (291,526.)

6,118. "Smoothing circuits for reducing the amplitude of harmonic currents." British Thomson-Houston Co., Ltd., and J. C. Read. March 4th, 1927. (291,529.)

6,164. "Thermionic valves." P. Freedman. March 4th, 1927. (291,531.)

6,488. "Electrical connecting devices." A. Bray and G. Bray & Co., Ltd. March 8th, 1927. (291,536.)

7,118. "Ball-and-socket joints for electric light and other like pendants." H. E. Mathews and J. Hill & Co., Ltd. March 14th, 1927. (291,547.)

7,752. "Electrical induction motors." D. B. Hoseason and Metropolitan-Vickers Electrical Co., Ltd. March 21st, 1927. (291,553.)

8,447. "Cord grips for electrical apparatus." C. W. D. Peel. March 28th, 1927. (291,555.)

9,154. "Loud-speaker cones for radio receiving sets." C. H. Naylor. April 4th, 1927. (291,563.)

9,177. "Cases for portable secondary batteries." A. E. Frost and A. E. Flowers. April 4th, 1927. (Addition to 268,066.) (291,564.)

9,723. "Supporting means for telephonic sound-reproducing devices." Graham Amplion, Ltd., and Z. E. Camelinat. April 8th, 1927. (291,569.)

9,969. "Motor-car head lamps." H. Workman. April 11th, 1927. (Cognate application 27,806/27.) (291,571.)

10,489. "Light signals for aerial navigation." E. S. Andrews (J. Pintsch Akt.-Ges.) April 19th, 1927. (291,578.)

10,731. "Track braking apparatus for mechanically- or electrically-propelled vehicles." R. C. Mortimer and Metropolitan-Vickers Electrical Co., Ltd. April 21st, 1927. (291,581.)

10,750. "Circuit arrangements for selectors in automatic and semi-automatic telephone systems." Siemens Bros. & Co., Ltd., and D. A. Christian. April 21st, 1927. (Cognate application, 2,026/28.) (291,582.)

11,242. "Electric wire attachments." C. R. Cook. April 27th, 1927. (291,583.)

12,076. "Electric cables." Callender's Cable and Construction Co., Ltd., J. F. Watson, P. V. Hunter, and A. E. Wilson. May 5th, 1927. (291,589.)

12,110. "Electric resistance and the manufacture thereof." S. G. S. Dicker (Naamlooze Vennootschap Philips Gloeilampenfabrieken). May 5th, 1927. (291,591.)

13,914. "Electric storage batteries." Van Raden & Co., Ltd., and J. P. Starley. May 24th, 1927. (291,599.)

15,181. "Reflectors for radiant energy." Sun Electrical Co., Ltd., and R. J. Rawlings. June 7th, 1927. (291,606.)

16,242. "Wireless signalling systems." W. J. Brown and Metropolitan-Vickers Electrical Co., Ltd. June 18th, 1927. (291,619.)

16,695. "Clamps for electric conductors." J. W. Hofmann. June 23rd, 1927. (291,623.)

16,835. "Electric cables." Callender's Cable and Construction Co., Ltd., and S. J. Bryce. June 24th, 1927. (291,625.)

16,929. "Multiple-core electric cables." W. Brown. June 25th, 1927. (291,626.)

19,993. "Joint sleeves for multi-conductor electric cables." Land-und Seekabelwerke Akt.-Ges. October 9th, 1926. (278,674.)

20,900. "Variable electric condensers." L. Sacco. August 8th, 1927. (291,643.)

21,568. "Sound-reproducing devices such as loud-speakers." A. P. Welch. August 16th, 1927. (291,645.)

24,667. "Safety suspension devices for lifts or elevators." F. Janotta. September 18th, 1926. (277,703.)

26,051. "Discharge devices for detecting and amplifying electric oscillations." British Thomson-Houston Co., Ltd. October 2nd, 1926. (Addition to 223,921.) (278,387.)

29,098. "Lightning conductors." W. Pickard and R. Spencer. November 1st, 1927. (291,673.)

31,304. "Insulation of electrical condensers." R. Bosch Akt.-Ges. January 5th, 1927. (283,144.)

31,578. "Electrical testing instruments." Electroflo Meters Co., Ltd. (Republic Flow Meters Co.). November 24th, 1927. (291,681.)

31,701. "Cathodes for mercury-vapour apparatus." Dr. W. Dallenbach. November 24th, 1927. (291,683.)

34,290. "Electric heating elements." G. Pate and J. R. Laird. December 19th, 1927. (291,694.)

35,418. "Construction of transformers for electric welding." Ateliers de Constructions Electriques de Charlerol. October 12th, 1927. (Addition to 283,131.) (291,700.)

1928.

760. "Electric dimmer switches." W. Row. January 9th, 1928. (291,704.)

1,850. "Electric incandescent lamps." General Electric Co., Ltd. February 4th, 1927. (284,693.)

2,002. "Electric sewing-machine outfit." W. Fairweather (Singer Manufacturing Co.). January 21st, 1928. (291,707.)

2,906. "Thermionic valve amplifying systems." British Thomson-Houston Co., Ltd. January 28th, 1927. (284,587.)

3,301. "Caps for electric lamps and the like." General Electric Co., Ltd. February 8th, 1927. (285,009.)

4,716. "Ignition coils." R. Bosch Akt.-Ges. April 2nd, 1927. (288,170.)

5,865. "Electric drilling apparatus." C. Contal and P. Krettly. March 5th, 1927. (286,600.)

7,566. "Electron tube installations, particularly wireless transmitters." C. Lorenz Akt.-Ges. March 18th, 1927. (287,171.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from June 20th:—

Cuirass Protects and Preserves (lettering and design). No 484,864. Class 1. Insulating paints, &c.—British Bye-Products, Ltd., Abbey House, Victoria Street, S.W.1.

Luturn, Ask for Luturn, Always Best (lettering and design). No. 489,247. Class 8. Electrical batteries for use in radio-telephony.—Louis Turner & Co., Ltd., 5-11, Waterloo Street, Newcastle-on-Tyne.

Kemco. No. 489,120. Class 18.—William Kemp & Co., 159, Buchanan Street, Glasgow.

(Design). No. 489,679. Class 18. Electric radiators for heating.—Willis and Bates, Ltd., Pellon Works, Springhall Lane, Halifax.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABINGDON.—Houses (36) for the T.C.; J. P. Barrett & Sons, contractors, Wantage.

ALDERSHOT.—Reconstruction of Alexandra Cinema; H. C. Baker, architect, Grosvenor Road.

BEXLEY.—Nurses' home, Mental Hospital (£15,000); A. Monk, Lower Edmonton.

BIRMINGHAM.—Cinema, Moseley Road, for Alhambra Theatre (Birmingham), Ltd.

BLYTH.—Sweetmeat factory, Quay Road; Cowens & Co.

BOLTON-UPON-DEARNE.—Housing scheme (27), Furlong Road and Chapel Street; W. H. Adams, architect, Council Offices.

BOZEAT (WELLINGBOROUGH).—Factory for J. H. Taylor, Olney Road (£10,000).

BRADFORD.—Extension of the Midland Hotel, for London, Midland and Scottish Railway.

BRIGHTON.—Clearance and rehousing, Carlton Hill (£157,000); borough engineer. Rebuilding 177-8, Western Road (£21,000); George Lynn & Sons.

BURY ST. EDMUNDS.—Cinema, for the proprietor of the Playhouse.

COLCHESTER.—Maternity home, Broom Hall; Medical Officer of Health. Additions, Arclight Printing Works, Maidenhead Street; Duncan Clark & Beckett.

DORCHESTER.—Re-erection of "Blanchard," Bladen Estate, Briantspuddle, residence of Piers Debenham. Rebuilding business premises, High West Street and Trinity Street, for Genge & Co., Ltd., drapers. Alterations, &c., 53, South Street, for Timothy White & Co., Ltd., 30, Chandos Street, Portsmouth.

EDINBURGH.—Secondary school, Leith, for the E.C.; Reid and Forbes, architects, 7, Ainslie Place.

EXETER.—Re-erection of "Bellenden," Duryard Estate, for Col. R. A. Moore-Stevens.

FAREHAM.—School (250 places), for Hants E.C.; director of education, The Castle, Winchester.

FARNHAM ROYAL (BUCKS.).—Houses (40), Leeds Road West, for Carlisle, Ltd.

GAINSBOROUGH.—Re-erection of portion of Trent Flour Mills (electrically equipped), for Townrow's, Ltd., Chesterfield (£20,000). Elementary school, Sandsfields Lane; Scorer & Gamble, architects, Bank Street Chambers, Lincoln.

GLASGOW.—Offices, dining room, &c., at Millroad Street, for United Dairies (Scotland), Ltd., 93, Claythorn Street; the manager. Workshop at Cowlairs Road, for London & North-Eastern Railway; the manager.

HALESOWEN.—Grammar school; A. V. Rowe and A. T. Butler, architects.

HARPENDEN.—Roman Catholic church and sacristies; Frederick Walters, architect, 28, Great Ormond Street, London, W.C.; John Longley & Co., builders, Crawley, Sussex.

IRISH FREE STATE (DUBLIN).—Cinema (£90,000), O'Connell Street; Meagher & Hayes, contractors, Drinan Street, Cork. Houses (506), Emmett Road area, Inchicore, for the City Commissioners; city architect, Exchange Buildings, Lord Edward Street.

(QUEENSTOWN, CO. CORK).—Reconstruction of Admiralty House; Ashlin & Coleman, architects, Dublin.

LARBERT (STIRLINGSHIRE).—Reconstruction of Central School after fire; architect, Education Authority, Stirling.

LEATHERHEAD.—Additional 28 houses for the U.D.C.; surveyor. Church hall for the Parochial Committee; C. H. Rose, The Croft, St. Nicholas Hill.

LEEDS.—Convalescent home (£10,000); Leeds Babies Welcome Committee.

LONDON (WAPPING, E.).—Tenements (£34,380); Canonbury Construction Co., Ltd.

(CAMBERWELL, S.E.).—Tenements, Oliver Goldsmith Estate; L.C.C. architect.

(GREENWICH, S.E.).—Tinware factory, John Penn Street, for Francis & Sons, Ltd.; J. H. Coram.

(LEWISHAM, S.E.).—Elementary school, Coopers Lane; L.C.C. Education Committee.

(BATTERSEA, S.W.).—Three further blocks of tenements, Plough Road; borough engineer. Extensions, Battersea Polytechnic; Campbell, Jones, Son & Smithers. Buildings, Stoney Lane; Anning & Cobb.

LOWESTOFT.—Garage, London Road North; United Automobile Services, Ltd.

MARGATE.—Synagogue, with electrical and heating work; Reeve & Reeve, architects; E. Peall & Co., builders (£6,000).

NEWCASTLE-ON-TYNE.—Police court buildings, Pilgrim Street; Cackett & Burns Dick, architects, Pilgrim Street.

NEWPORT (I.O.W.).—Municipal offices; Special Corporation Committee.

NORTHFLEET.—Cinema, High Street; Messrs. Clements.

OXFORD.—Garage extension, Iffley Road; South Midland Motor Co. Enlargement, St. Clement's School; governors.

PAIGNTON.—Drainage scheme (£218,500); F. W. Vanstone and Sons, engineers.

PAISLEY.—School for Renfrewshire Education Authority; H. Cook & Hamilton, architects, 7, Gilmour Street.

PETERBOROUGH.—Additional 200 houses for the T.C.; borough surveyor.

PORTSMOUTH.—Central tramway depôt, Eastney, for the T.C.; general manager. Additional housing scheme (1[illegible] and flats, for the T.C.; borough surveyor. Estate development, Hildea; Dye & Chase. Extensions, Kent Street School (£14,000); S. Salter, for Education Committee.

PRESTWICH.—Housing scheme, Palefield Estate; U.D.C. surveyor. Garages for Co-operative Society, Mowbray Avenue; J. B. Thornley, architect. Stock rooms, bleaching house, &c., Mere Clough; Waterdale Dyeing and Finishing Co., Ltd.

RAMSBOTTOM.—Extension of Rosebank Printworks, for Thornbull & Stockdale.

RHYL.—Proposed new pier and concert hall, &c.; surveyor to U.D.C.

ROCHESTER.—Public hall (£5,250), for the T.C.; borough surveyor.

ROMFORD.—Extensions, Rush Green Isolation Hospital, with electrical and heating work (£66,500), for the Joint Hospital Board; W. Evans, architect.

RUGBY.—Additional 50 houses for the R.D.C.; surveyor.

ST. HELENS (LANCS.).—Business premises and warehouse, Haresfinch Road, for the Industrial Co-operative Society; secretary.

ST. NEOTS (HUNTS.).—Electric light installation, Institution, for the B.G.; clerk.

SADDLEWORTH.—Council school, Barn Meadow, Delph; clerk to the Education Committee.

SALFORD.—Extension of the Royal Technical College, Peel Park; R. S. Martin, Secretary of Education.

SANDBACH.—Business stores for the Co-operative Society; Alfred Price & Sons, architects.

SHAWFORD (WINCHESTER).—Additions to "Littlestowe," for Brig.-Gen. A. Phelps.

SKEGNESS.—School extensions for Lindsey E.C.; Scorer, Gamble & Co., architects, Bank Street Chambers, Lincoln (returnable deposit of £2 2s.).

STALYBRIDGE.—Electric lighting, Millbrook Police Station; Watch Committee.

STIFFORD (ESSEX).—Houses (30), Nutberry Estate, for F. C. Stark.

STOCKPORT.—Tramcar shed extensions, for the T.C.; H. Hamer, borough surveyor.

STOURBRIDGE.—Electric light installation, Wordsley Institution, for the B.G.; clerk.

STRETFORD.—Canteen extensions, Westinghouse Road; Metropolitan-Vickers Electrical Co., Ltd. Stores and garages, Westinghouse Road; Ashworth & Co. (Timber), Ltd. 58 houses, Great Stone Road and other roads; J. G. Whitelegge. 49 houses, Bedford Road; W. R. Rochell.

SWANSEA.—Additions, Borough Treasurer's offices, Seymour Place; borough architect.

SWINTON AND PENDLEBURY (LANCS.).—Post office and telephone exchange, for H.M. Office of Works, King Charles Street, London, S.W.

TYNEMOUTH.—Theatre, Russell Street; Dixon & Bell.

WESTBOURNE (EMSWORTH).—Electric light installation, offices, for the B.G.; clerk.

WHITEFIELD.—Housing scheme (160), Narrow Lane; C. F. Porter, clerk to U.D.C.; Council Offices.

WHITEHAVEN.—Additional 40 houses, Bransty, for the T.C.; borough surveyor. Houses (28), Loop Road, for James Leslie & Sons.

WORTHING.—Additional 130 houses for the T.C.; borough surveyor.

JUL 9 1928

The ELECTRICAL REVIEW

FOUNDED 1872

VOL. CII. No. 2640. [All Rights Reserved.] JUNE 29, 1928. [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage.] PRICE SIXPENCE.

LITHOLITE INSULATORS, Ltd.
55—57, Hackney Grove, London, E. 8.
FIREPROOF AND OTHER GRADES.
BAKELITE MOULDINGS.
OLDEST ESTABLISHED.

HACKBRIDGE TRANSFORMERS
KIOSKS, VOLTAGE REGULATORS
Hackbridge Electric Construction Co., Ld.,
Hersham, Walton-on-Thames. *'Phone: 760*

FERGUSON, PAILIN, LTD.,
SPECIALISTS IN
SWITCHGEAR.
Higher Openshaw, Manchester.
'Phone: OPENSHAW 600. *'Grams:* TENSION, MANCHESTER.

SHUNT REGULATORS
CRESSALL MANUFACTURING CO.,
31-32, Tower Street, Birmingham.

INSTRUMENTS, CIRCUIT-BREAKERS,
AUTO-CUT-IN & CUT-OUT
THE **Record Electrical Co.,** LTD.
BROADHEATH, MANCHESTER.
TELEPHONE: 164 ALTRINCHAM.

TRELLEBORG'S
GENUINE EBONITE
Sheet, Tube, Rod, Panels, &c.
Machining to the Trade a Speciality.
Let us Quote. Highest Grade. Largest Stocks.
TRELLEBORG EBONITE WORKS, LTD., UNION PLACE, WELLS STREET, LONDON, W.1.

SWITCHGEAR.
ERNEST F. MOY, LTD.,
Manufacturing Electrical Engineers and Government Contractors,
GREENLAND PLACE, CAMDEN TOWN, LONDON.

"SMALL POWER"
MOTORS & DYNAMOS.
THE
SMALL POWER DYNAMO & MOTOR CO., Ltd.,
OLD LANE, OPENSHAW, MANCHESTER.

SAXONIA ELECTRICAL WIRE CO., LTD.,
Est. 1895. GREENWICH, S.E. 10.
EXTRA FLEXIBLE CABLES and CORDS.
DYNAMO and TRAILING LEADS.
V.I.R. and Asbestos covered
SILK, COTTON and ENAMEL INSULATED
MAGNET and RESISTANCE WIRES.

CHURTON A.C. MOTORS.
T. HARDING CHURTON & CO., LTD.,
LEEDS.

Cutting
ELECTRIC MOTORS.
ELECTRO DEPOSITING GENERATORS.
CUTTING BROS. & CO., LTD., STAMFORD.

"EMPIRE"
HIGH TENSION LINE EQUIPMENT
Pole type Switches, Choke Coils, Disconnecting Switches, Fuses, Lightning Arresters, Pole type Units up to 132,000 v.
Ask for Free Descriptive Matter.
ELECTRIC CONTROL LTD.,
EMPIRE WORKS, GLASGOW.
Birmingham, Leeds, London, Manchester, Swansea, Australia, New Zealand, South Africa and Shanghai.

For REWINDS of . . .
Every Description,
CONSULT
BURDETTE & Co., Ld.
'Phone: p 4572 & 3068.
5, POCOCK STREET, BLACKFRIARS, S.E.1.

BEADS GLASS
"BALLSOK"
BLACK
LIONEL ROBINSON & CO.,
The Insulator People, 3, STAPLE INN, HOLB., W.C.1.

WELDING PLANTS ELECTRODES
Quasi-Arc
TEL.: VIC 6236-7
15, Grosvenor Gdns., Victoria, London, S.W.1

FANS
— FOR EVERY APPLICATION. —
Our Speciality for 25 years.
S. G. LEACH & CO., Ltd.
26/30, Artillery Lane, London, E 1.

E. DAWSON & CO.,
LAMPS (AS USUAL),
in addition
Wireless Valves, Crystal and Valve Receiving Sets, Head 'Phones, &c.
10, Gray's Inn Road, London, W.C. 1.
('Phone: Holb. 5341-2.)

JULIUS SAX
Specialists in
EST. **BELLS** 1855.
and
Wall Plugs.
"West Lodge," 27, Lower Mall, Hammersmith, W.6.

New Life for the Land.
See Sup. 8 and 9.

MOTORS
BY
McClure & Whitfield,
Small Power Dynamo Co., Ltd.
Agents
CITY ELECTRICAL CO., 1, Emerald Street, LONDON, W.C. 1.

VINCENT
Important— *See Sup. 26.*

ENQUIRIES FOR QUALITY
MOULDINGS
SHOULD BE ADDRESSED
DE-LA-RUE-WALTHAMSTOW 'Phone: 0756.

SWITCHGEAR. CONTROL GEAR.
MAVOR & COULSON, Ltd.,
GLASGOW.

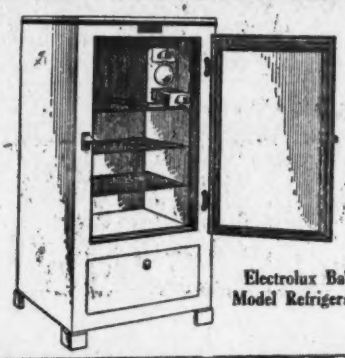
CURTIS MFG. CO., LTD.
CONDUIT PLACE, PADDINGTON, LONDON, W.2.
RESISTANCES (SLIDING RHEOSTATS).
OF CONSTANT RATING FOR
ALL PURPOSES.

ZENITH
ELECTRIC CO. LTD.
REGULATING RESISTANCES
"ZENITE" EMBEDDED RESISTANCE UNITS
SPECIAL TRANSFORMERS
Zenith Works, Villiers Rd., Willesden Green, London, N.W.2.

FOR X-RAY, ULTRA-VIOLET
AND ALL OTHER
ELECTRO-MEDICAL APPARATUS
Write to—
THE MEDICAL SUPPLY ASSOCIATION, LTD.
167 to 173, Gray's Inn Road, LONDON, W.C.1.
See our Advt. on p. xxiv. of this issue.

KANTARK.
M.E.M. *See page xi.*

Advertisement Index, see page xliv. *Official Notices, see Sup. 30.*



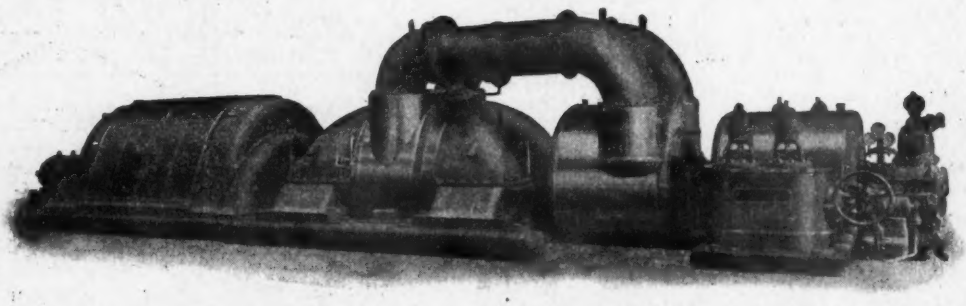
Electrolux Baby Model Refrigerator.

"Yorkshire" Copper Tubes for Domestic Refrigerating Plant.

The "Electrolux" Refrigerating Appliances are too well known in the Trade to need comment. It is interesting to note, however, that all the "Electrolux" Models are fitted with "Yorkshire" Copper Tubes.

YORKSHIRE
Nothing but Tubes
COPPER WORKS LTD
LEEDS - - - ENGLAND.
Telephone: 20031. Telegs: "Tubes, Leeds."
London Office: 53, New Broad St., E.C.2.

RW & Co



RICHARDSONS WESTGARTH-BROWN BOVERI
TURBINES & POWER STATION EQUIPMENT
MAXIMUM EFFICIENCY.

OUR ENQUIRY DEPT. IS AT YOUR SERVICE.

Tel. No. 2171 WEST HARTLEPOOL.
Telegrams: "RICHARDSONS," HARTLEPOOL.

RICHARDSONS, WESTGARTH & CO., LTD.
HARTLEPOOL ENGINE WORKS,
HARTLEPOOL.

Mica Micanite

Insulators for every description of Electrical Work.

Superfine "MICAYLOR" Diaphragms for Sound Boxes

We supply 2 Million Condenser Plates Weekly to the Magneto & Wireless Trades.

We specialise in Cutting, Gauging, Machining

Taylor & Petters, Ltd. 311, Westmoreland Place, City Road, N.1. Phone: Clerkenwell 4105 Teleg: "Micaylor, London"

INSULATING VARNISHES The Best

"OHMALINE" BLACK
No. 68, Air Drying
No. 157, Flexible Baking
No. 166, General Utility Baking

"SHAYDOLITE" for Colouring Lamps.

"ARMACELL" CLEAR GOLDEN
No. 1, Baking
No. 213, High Tension Work.
No. 317, General Utility

"ANTI-SULPHURIC" ENAMEL for Battery Rooms.

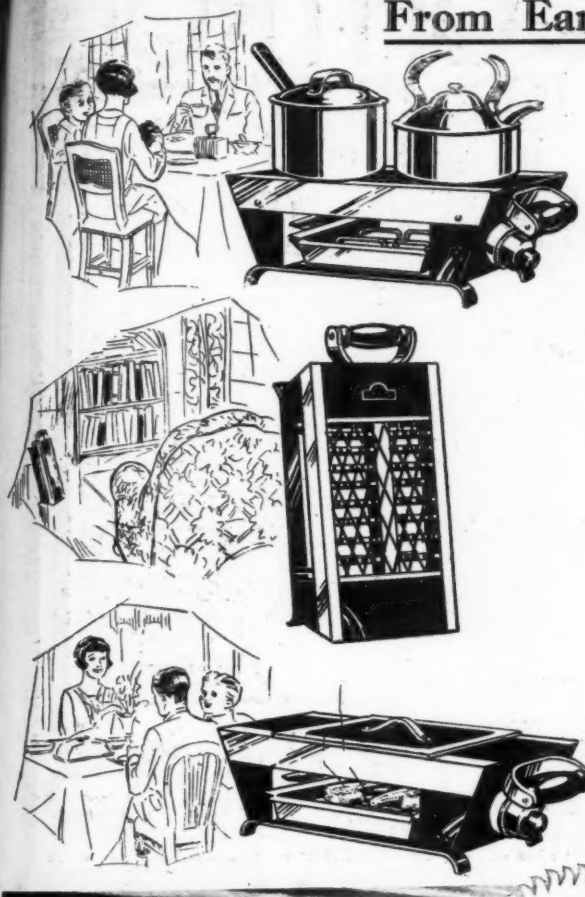
"PAKYDERM" FINISHING VARNISH. Black or Golden

"INSULDERM" HEAT RADIATING ENAMEL.

"STICOLINE" for Building up Mica.

GRIFFITHS BROS. & Co., LONDON, LTD.
BERMONDSEY, LONDON, S.E.16.
The Oldest All-British Insulating Varnish Makers.

From Early Morn till Late at Night



no other electrical appliance has such a multitude of sheer utilities as the

Heatrae

Breakfast Cooker.

From the point of view of the Supply Station —it is an economical but steady all-the-year-round "consumer."

Wholesalers and Contractors have proved it to be an all-the-year-round seller.

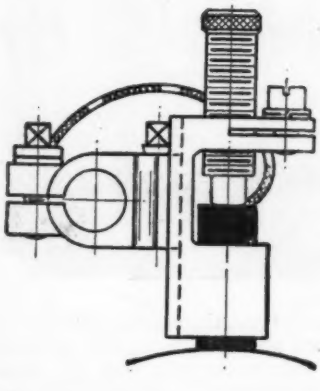
The most handy and practical three-in-one-purpose electrical product ever offered.

ELECTRIC FIRES LTD. NORWICH

Prices from 37/6 (subject).

Heatrae

"WESTMINSTER" BRUSH HOLDERS.



80,000 SUPPLIED. MADE TO SUIT ANY MACHINE.

Manufacturers of—

DYNAMOS & MOTORS. "PARTRIDGE" PRESSURE DETECTORS.
SWITCHGEAR. ELECTRIC WELDERS.
"PARTRIDGE" EARTHING DEVICES. PHOTOGRAPHIC ARC LAMPS.
MEDICAL ARC LAMPS.

The WESTMINSTER ENG. CO., Ltd.,

Telephones: Willesden 1700-1701. WILLESDEN JUNCTION, N.W.10.

A SOUND ELECTRICAL TERMINAL.

WITHOUT **SOLDER**

USED FOR **FUSE WIRES, CABLES,** AND **WIRES** of all Descriptions.

SMALL, SUITABLE FOR TELEPHONE LINES.

OTHER SIZES FROM ⅛" TO ⅜".

Send for List and Full Particulars.

ROSS COURTNEY & CO., LTD.,
ASHBROOK WORKS, LONDON, N.

The Last Word in Fibre!!

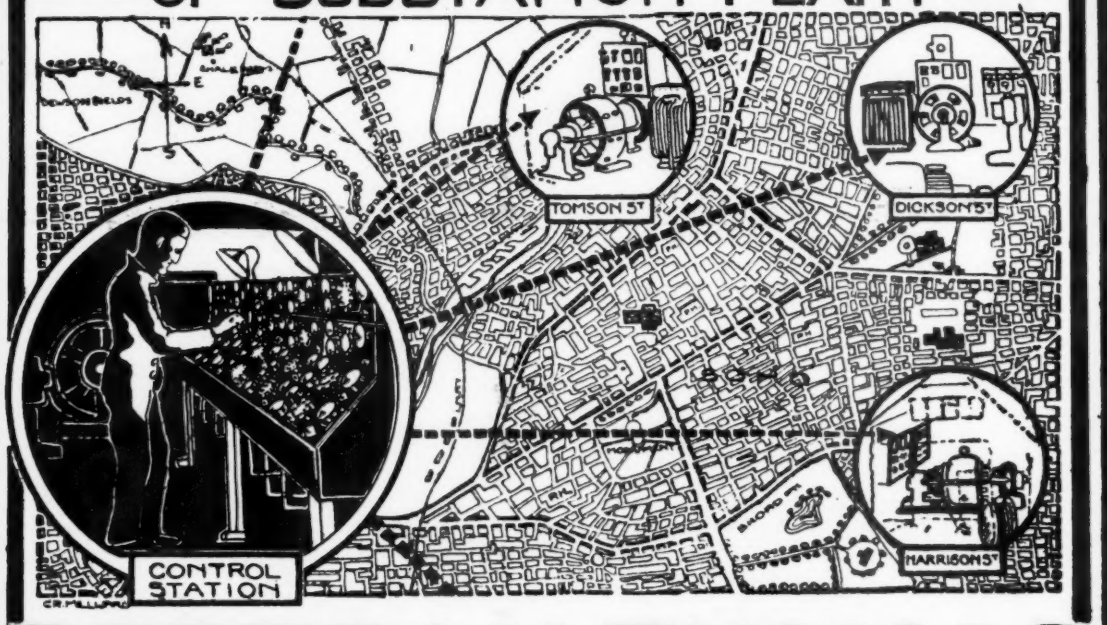
Vulmos

GENUINE VULCANIZED FIBRE

SHEETS · RODS · TUBES · GEARS · INSULATORS · WASHERS · BUSHES · ETC.

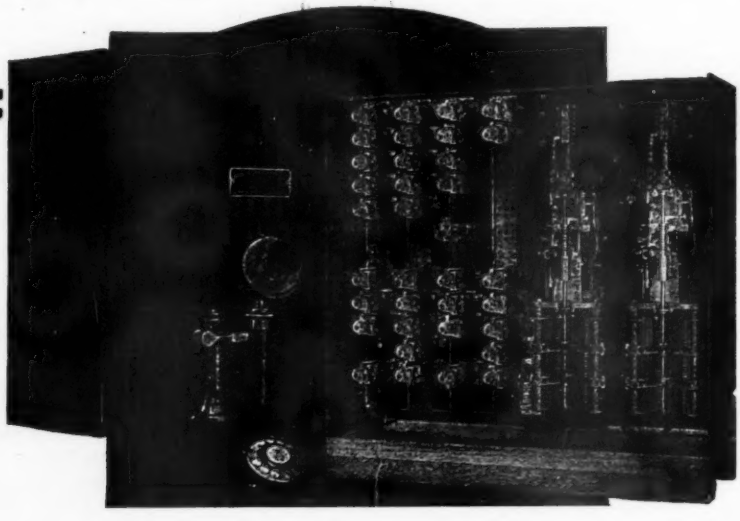
MOSSES & MITCHELL
GOLDEN LANE LONDON E.C.

REMOTE CONTROL
OF SUBSTATION PLANT



BERTRAM THOMAS
WORSLEY ST · HULME · MANCHESTER

March with the Times "Step by Step."



Upwards of 4,000,000 Strowger Automatic Telephones on order or under construction throughout the world.

In public telephone service, Strowger Robots, the mechanical equivalents of the old time telephone operators, are already serving the world to the tune of over 4,000,000 stations. In a private capacity they can serve you and give telephone facilities unequalled for speed, accuracy, privacy, and above all reliability.

Send for particulars of any capacity of Strowger Private Automatic Exchange. The type illustrated serves up to 10 lines.

AUTOMATIC TELEPHONE MANUFACTURING CO., Ltd., Strowger Works, LIVERPOOL

STROWGER ATM

H.T. & E.H.T. INSULATORS IN STANDARD PATTERNS

THIS catalogue gives dimensioned drawings of many standard patterns of E.O.A. Insulators including—

Line Insulators, Fuse Insulators, Pin-type Insulators, L.T. and H.T. Shackle Insulators, Bus-Bar Insulators, Battery Stands, Fuse Handles, Aerial Insulators, Leading-in Tubes, Resistance Tubes, Cleats, Bushes, Bobbins, Reels, Switch Bases and Porcelains of intricate designs,

as well as a number of complicated patterns in which "FIREITE" the heat resisting material, is supplied.

E.O.A. Insulators are perfectly vitreous and are tested under up to date methods to ensure their satisfactory performance on the most exacting service.

We can quote keen prices and prompt deliveries for the standard patterns illustrated in the catalogue as well as for special shapes to customers own dimensioned blue prints.

Write for a copy of the catalogue and send us your specific enquiries for porcelain insulators of all kinds.

THE
ELECTRIC & ORDNANCE ACCESSORIES COMPANY, LIMITED.,
(Associated with VICKERS LIMITED)

Telegrams: E.O.A., HANLEY.

HAVELOCK & SHELTON POTTERIES, HANLEY, STOKE-ON-TRENT.

Telephone: HANLEY, 63.

London Office: VICKERS HOUSE, BROADWAY, LONDON, S.W.1.

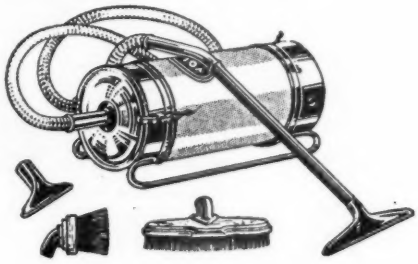
REGISTERED OFFICE WARD END WORKS, BIRMINGHAM.

X 06

300 VOLTA'S sold by one firm.

With no previous experience in selling electric cleaners, one Distributor disposed of 300 Volta Cleaners in twelve months—the result of training by us, close co-operation between us and the enthusiastic application by the Distributor. One Volta sold every day and a handsome profit on each one.

Staff training by us has been beneficial to many Volta Dealers. Let us show you how to conduct a successful cleaner campaign.

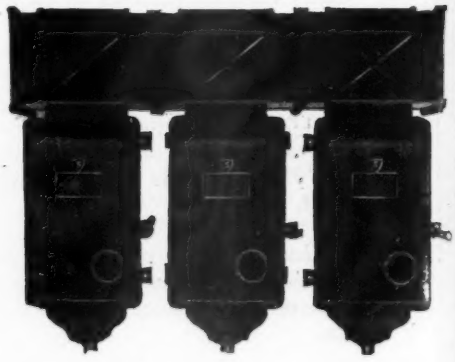


Volta V, the domestic model retails at **£11 : 17 : 6.**

Advert of

VOLTA LTD., Kern House, 36/38, Kingsway, W.C.2.

S SWITCHGEAR



DRAW-OUT OIL SWITCH PILLARS

AIR BREAK IRONCLAD SWITCHGEAR

LOW TENSION ENCLOSED SWITCHGEAR

CIRCUIT BREAKERS UP TO 10,000 AMPS.

NEW AND IMPROVED DESIGNS

OIL SWITCHES UP TO 22,000 VOLTS

RELIABLE, STRONG AND DURABLE

IRONCLAD OIL BREAK SWITCHGEAR

SEND US YOUR NEXT ENQUIRY.

Get the Best.

J. G. STATTER & Co.,
Queen Anne's Chambers,
WESTMINSTER, S.W.1
Telephone: VICTORIA 6196.
Works: AMERSHAM COMMON
BUCKS.

BOTRADE SWITCH & DISTRIBUTION GEAR

ALWAYS LEADS THE WAY—

SMALL MAIN SWITCHES — THE BOTRADE WAS THE FIRST SMALL 15-AMP. SWITCH AND FUSE EVER PLACED BEFORE THE TRADE.—[1922].

HOUSE SERVICE SWITCH SPLITTERS — THE FIRST 15-AMP. SWITCH SPLITTER WAS BOTRADE.—[1926].

TEAK FUSEBOARDS — IT WAS BOTRADE THAT FIRST GAVE THE TRADE THE FIRST 5-AMP. H.O. TYPE FUSEBOARD — AND IT IS FITTED WITH NON-CORRODIBLE HINGES.—[1926].

CUT-OUTS — THE FIRST SUCCESSFUL L.P. CUT-OUT WAS THE BOTRADE REGISTERED ARC DAMPING TYPE.- [1914.]

PHOSPHOR BRONZE — BOTRADE SWITCHGEAR FIRST GAVE PHOSPHOR BRONZE CONTACT CLIPS IN STANDARD L.P. GEAR.—[1926].

I.C. DIS. BOARDS — BOTRADE I.C. DISTRIBUTION BOARDS FIRST GAVE THE CONTRACTOR THE ADVANTAGES OF NO-TROUBLE WIRING. THE BOTRADE PAT. UNIVERSALLY JOINTED BATTENS.—[1923].

AND IS STILL LEADING!

"You cannot buy better gear."

LONDON: G. N. Nicklin & Co., 71, Stockwell Rd., S.W.9. 'Phone: Brixton 3498.
LEEDS: T. Milnes, 28, Bond Street. 'Phone: 27519.

S·BILL·&·Cº·LIMITED
QUEENS RD·ASTON·BHAM

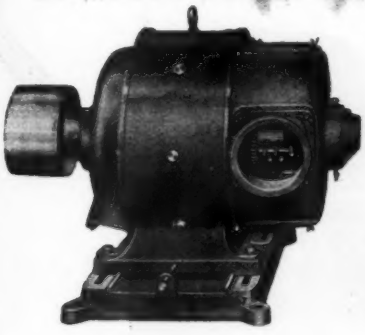
PHONE: EAST 0712 — THE DISTINCTIVE REGD. TRADE BOTRADE MARK ELECTRICAL GEAR — GRAMS: AICHOBHAM

MANCHESTER: Pollard & Smith, 78, King Street. 'Phone: City 1255.
GLASGOW: Klyde Electric Supply Co., 74, York Street. 'Phone: Cent. 3250.

'PHONE: CENTRAL 3300.

T.B.T. D.C. MOTORS

DELIVERIES: FROM STOCK.



171, QUEEN VICTORIA STREET, LONDON, E.C. 4.

Why Nearly Half our Orders come from Recommendation!

Bakelite "ASHDOWN" Mouldings

have established a reputation in the Trade second to none for Quality and Accuracy. You can *depend* upon "Ashdown" Mouldings

MORE—the completeness of our organisation enables us to make our own tools (thus effecting considerable economies to you).

ALSO—we make, machine and fit any necessary metal parts (still more saving).

AND—deliver the completed components all ready for fitting decidedly quicker than you might anticipate.

Ask Trade Opinions on "Ashdown" Service!

H.E. ASHDOWN BIRMINGHAM LTD.

'Phone: Northern 859. Perry Barr, B'ham. 'Grams: "Segment."

VULCANISED FIBRE

SHEETS RODS & TUBES.

MACHINED PARTS A SPECIALITY.

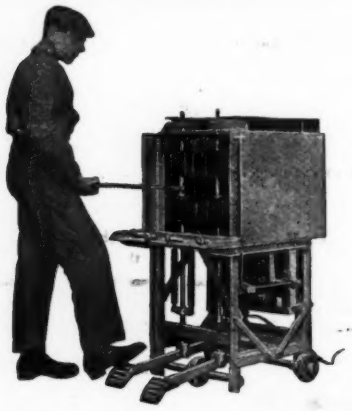
WHALEBONE — AN IMPROVED GRADE OF FIBRE.

LEATHEROID — DIAMOND INSULATION.

CELORON — A BAKELITE MATERIAL.

DIAMOND FIBRE CO., LTD., 75a, Queen Victoria St., LONDON, E.C.4

HEAT YOUR RIVETS ELECTRICALLY



A VITAL CONSIDERATION.

When one considers the vast amount of money that is spent per annum on rivetting, and also the vital part that it plays in engineering, one cannot help being a little surprised at finding the inefficient methods of fifteen and twenty years ago still being used in many works for heating rivets. Now that the problem is being investigated scientifically we are beginning to realise what important economies can be effected in this direction and what a valuable asset we have in the Electric Rivet Heater.

Write for Descriptive Pamphlet.

MARRYAT & PLACE, 40, HATTON GARDEN, LONDON.

CYCLONE

REGD TRADE MARK

FANS FOR ALL PURPOSES

INDUCED DRAUGHT,
DUST COLLECTION,
PLENUM HEATING & VENTILATION,
DRYING, &c., &c.

WE HAVE HAD 40 YEARS' EXPERIENCE IN FAN WORK AND CAN GUARANTEE SATISFACTION.

Write for Fan Booklet No 461 C.

MATTHEWS & YATES, LTD.,
SWINTON, MANCHESTER.
Also at LONDON, LEEDS, GLASGOW, &c.

for MOULDINGS

to your own designs
Bakelite, Plastic, Fireproof
Send your inquiries to

THE BROWNIE WIRELESS CO. (G.B.), LIMITED.

BROWNIE

NELSON ST. WORKS, MORNINGTON CRESCENT, LONDON, N.W.1.

POWER BELLS
FOR EVERY INDUSTRY

TANGENT Ironclad Power Bell for working direct from A.C. or D.C. power mains up to 250 volts.

Weatherproof Bells laminated for A.C. In cast-iron cases for fixing in exposed positions. High and low voltage.

Write for illustrated leaflet.

London: 25, Victoria Street, S.W.1.

TANGENT GENT & Co. Ltd. Established 1872

Newcastle-on-Tyne: Tangent House, Blackett Street.

GENT & CO., Ltd., Faraday Works, LEICESTER

Tel. Address: "Caulking, Piccy, London."

Tele. No.: Gerrard 9215 (4 lines).

For blowing dust out of electrical machinery, and other purposes where a powerful blast of air is required.

Write for Catalogue 14, 2nd Edn., giving full particulars of our Little Giant Drills, Grinders and Blowers.

The
Consolidated Pneumatic Tool Co., Limited,
Egyptian House, Piccadilly, London, W.1.
Main Works: Fraserburgh, Scotland.
Branches all over the world.

THE
"RAMIE"
CEILING ROSE
FITTED WITH THE
'RAMIE' (Patented) one-piece **PORCELAIN CONNECTORS**

Can be fixed and connected up in the *minimum* of time, even in the most difficult position.

Perfect insulation

Porcelain Throughout

No metal parts

No screws to lose.

Registered No. 727911.

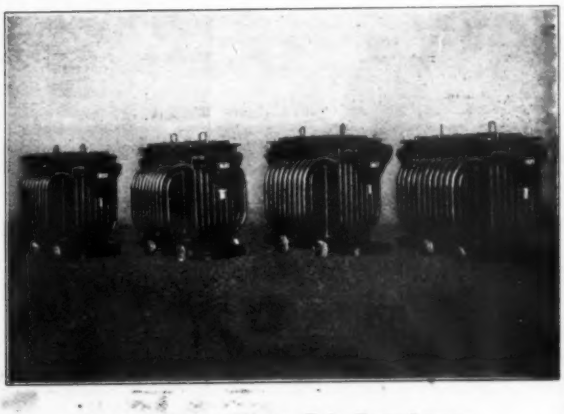
SAVE TIME AND EXPENSE.

Stocked by all usual factors and suppliers or can be obtained direct from

J. MARTIN BLAIR,
Audrey House, Ely Place, LONDON, E.C.1.
Telephone: Holborn 0022.

Agents:
Messrs. PATERSON & SERVICE, 38, Bath Street, Glasgow.
" W. E. BEARDSALL & CO., LTD., 5, Victoria Bridge, Manchester.
" FLEXIBLE BEND CO., 5, North Street, Newcastle-on-Tyne.
" T. B. MORLEY & CO., LTD., Jameson Street, Hull.
" SANTON LTD., Dock Street, Newport, Mon.
" SOUTHERN AGENCIES, 81, Queen's Road, Brighton.

TRANSFORMERS
ANY SIZE TO 6,000 K.V.A.
TO B.E.S.A. SPECIFICATION.
HIGH AVERAGE EFFICIENCY
COMPETITIVE PRICES.



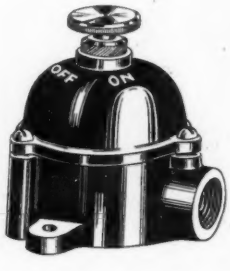
Set of "Smit" Mining Type Transformers, Supplied to a large British Colliery.

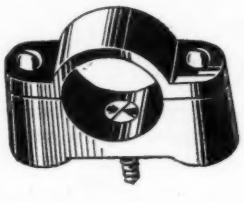
W. SMIT & CO. LTD. NIJMEGEN HOLLAND.

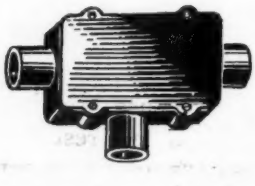
Sole Agents:
G. DIKKERS & Co. (ENGLAND) Ltd.,
Avenue Chambers,
Southampton Row
LONDON, W.C.1.

Telephone: Holborn 3100.

Walsall







The All-Steel Wiring System of Immense Adaptability.

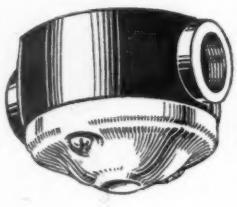
The widely divergent nature of important Contracts recently completed, where "Walsall" was *exclusively* employed throughout, emphasise the great adaptability of the "Walsall" System to every requirement whether for new Installations or for coupling up to existing ones.

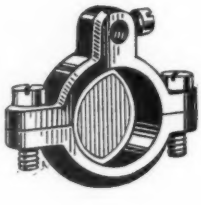
Under all conditions of service, normal or abnormal—the "Walsall" System has been found to be the most efficient, durable and the safest.

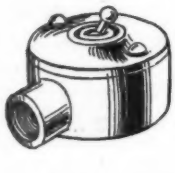
WALSALL
Hardware Manfg. Co., Ltd.,
Ablewell Street - - Walsall.

London Office & Stores:
Addison Bridge, Kensington Road, W.14.
Trade Counter:
23, Percy Street, Tottenham Court Rd., W.

LIVERPOOL: 4, Preston Street. GLASGOW: 40, Broomielaw. MANCHESTER: 9, Watling Street, Shudehill. LEEDS: York House, 21, York Place. BELFAST: College Square North. CARDIFF: West Wharf Road. LEICESTER: 20, New Street. COLCHESTER: 19-20, North Hill. NOTTINGHAM: Castle Warehouse, Castle Boulevard. S.1022



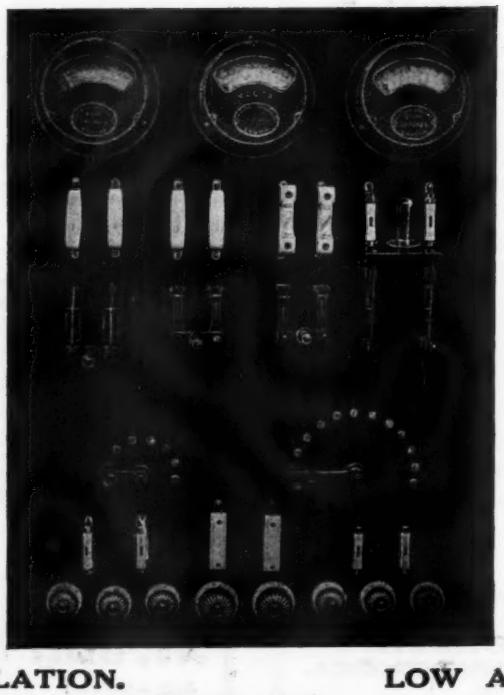




SILUMINITE PANEL.

ALL TYPES OF MOULDINGS.

L1



L5.

ARC SHIELDS, TUBES.

FIREPROOF GRADES.

HIGH INSULATION. LOW ABSORPTION.

For particulars

APPLY: **THE SILUMINITE INSULATOR CO., LTD.,**

TELEPHONE: ERITH 333.
TELEGRAMS: SILUMINITE, ERITH, KENT.

ERITH, KENT.

Empire Controllers

for

BOILER HOUSE AUXILIARIES

THE illustration shows an "Empire" A.C. Pushbutton Controller arranged for starting, stopping, and regulating the speed of an Induced Draught Fan in a Boiler House.

We have equipped many important installations with pushbutton control throughout for various auxiliaries such as Fans, Pumps, Stokers, Conveyors, etc.

WRITE FOR LEAFLET "S."

ELECTRIC CONTROL LIMITED,
EMPIRE WORKS, BRIDGETON, GLASGOW.

EMPIRE ELECTRIC CONTROL

"KANTARK"

M.E.M. "Kantark" Ironclad Cut-outs are fitted with the latest pattern "Kantark" fuse units, in which is embodied the result of years of experience and experiment.

The latest design is provided with a long break, the arc is confined to a position where it is not liable to extend to the case.

The Cut-outs comply with the exacting standards of performance laid down by the B.E.S.A. specification and I.E.E. Regulations.

For pressures not exceeding 250 volts a specially inexpensive, but equally effective, type is provided.

Send for particulars of the full range.

CUT OUT RISKS
by using
"KANTARK" CUT-OUTS.

MIDLAND ELECTRIC Manufacturing Co. Limited.
BARFORD ST. M·E·M BIRMINGHAM
SPECIALISTS IN IRONCLAD SWITCH & FUSE GEAR

Also at

LONDON, MANCHESTER, GLASGOW, NEWCASTLE, LEEDS, BRISTOL, BELFAST, DUBLIN, SYDNEY, BOMBAY, JOHANNESBURG, SHANGHAI and BUENOS AIRES.

AND ALL ELECTRICAL WHOLESALERS.

VENTILATING and EXHAUSTING ELECTRIC FANS.

Useful at all times for expelling fo l and vitiated air, the need, and consequently the demand, for these fans is much more evident in the summer. All sizes, from 10 in. to 48 in. diameter of blades are stocked.

ELECTRIC SYRENS.

The replacement of steam syrens by electrical syrens has been found necessary in many industries.
Sunco Syrens are manufactured in sizes having ranges from 330 yards up to 1½ miles.

ELECTRIC DRILLS.
Types N.U.3 and N.U.4.

With Morse Cone tool holder Universal winding as Type N.U.0 (above). Type N.U.3 has a drilling capacity up to ½" and N.U.4 up to ¾".

ELECTRIC DRILLS.
Types N.U.0 and N.U.1.

These drills have a Universal winding for both D.C. and A.C., and are wound for all voltages up to 250 volts. N.U.0 drilling capacity up to ¼", N.U.1 up to ⅜".

Electrical aids to Industry

Industrial Electrical Appliances have a wide sphere of usefulness in Works, Railway and Tramway undertakings, Dockyards, etc.

Many different types are manufactured for special functions and those illustrated here merely serve the purpose of drawing your attention to the fact that we can, and do, supply Tools and Appliances for industrial use.

You will save labour and expense by consulting us as to the appliances available for various operations.

SUNCO
Industrial Electrical APPLIANCES

THE SUN ELECTRICAL Co. LTD

Telegrams:
"Secabilis, Westcent, London."
Telephone:
Gerrard 9626 (10 lines).

118-120, Charing Cross Rd., LONDON——————W.C.2

LEEDS:
49-50, Park Place.
NEWCASTLE-ON-TYNE:
112, Pilgrim Street.

Transport for the Million

The ELECTRIC CABLE used on shipboard must take its share in the responsibility of conveying passengers and merchandise over the Seven Seas.

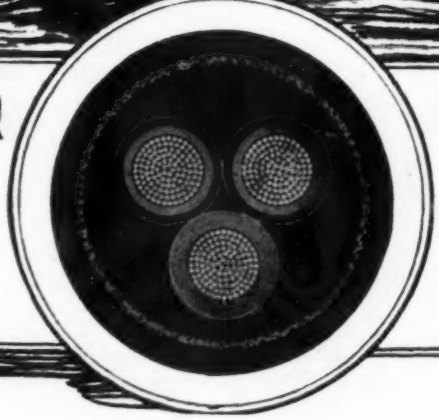
No Company is more fully aware of the need for reliability of Electrical Equipment than Callender's Cable & Construction Co., Ltd.

No effort is spared by the Company to assure that its products will fulfil the functions for which they are specified.

CALLENDER REINFORCED CAB TYRE SHEATHING for Electric Cables is specially designed to withstand the arduous conditions of service as trailing cables. The patent reinforcement greatly strengthens the sheathing without impairing the flexibility of the cable.

An interested booklet on Reinforced C.T.S. Cables is willingly sent upon application.

CALLENDER *Reinforced* C.T.S. CABLES



CALLENDER'S CABLE & CONSTRUCTION Co. LTD *Hamilton House,* LONDON·E·C4

Catalogues to use

HENLEY Terminal Box Catalogues are something more than mere Books of Reference. They contain such complete details, and cover practically every requirement for indoor or outdoor use, that they are literally Catalogues to use—to order from.

Henley Terminal Boxes are made in standard ranges to suit all types of cables.

Any or all of the eleven sections may interest you.

Place a X in the space provided below and mail to us.

HENLEY

TERMINAL BOXES

PLEASE SEND ME THE TERMINAL BOX CATALOGUES MARKED [X]

- U.E. 1. Cable Glands and Armour Grips. ☐
- U.E. 2. L.T. Indoor Vertical. ☐
- U.E. 3. H.T. Indoor Vertical. ☐
- U.E. 4. Indoor Right Angle. ☐
- U.E. 5. Inverted Outdoor Type ☐
- U.E. 6. Telephone Type. ☐
- U.E. 7. Porcelain Terminal Ends. ☐
- U.E. 8. Cablegrip Type. ☐
- U.E. 9. Miscellaneous and Lead Boxes. ☐
- U.E. 10. For Machines Transformers, etc. ☐
- U.E. A. Spare Porcelain Insulators, Fittings, etc. ☐

Name..... *Address*.....

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., HOLBORN VIADUCT, LONDON, E.C.1

E6/E.R.

It took many men to build one ISCO *Cut Out*

"IT took many men to build one ISCO Cut-out." Broadly speaking true, but the "emancipation of woman" has left few spheres of activity still untouched by the fair sex. The nimble fingers and deft movements characteristic of womankind have long been utilized for the assembling and packing of the smaller grades of mechanical appliances. In the assembling bays the bases and cases of the cut-outs proceed from hand to hand, each change adding parts until the completed box is ready for inspection, packing and storage for delivery. To be in accord with the accepted order of things, the feminine sex must set its seal to the otherwise manly ISCO Cut-out.

ISCO

The Super Cut-out — Safe on Shorts

IRONCLAD SERVICE CUT-OUTS

MANUFACTURED BY:-

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., HOLBORN VIADUCT, LONDON, E.C.1

L18 E.R.

CONSTANT ILLUMINATING POWER

QUALITY of product, service to contractors and retailers and an advertising campaign in the Industrial and General Press, are things of vital importance to you.

Stella Electric Lamp sales are increasing week by week. You will have to meet a definite demand.

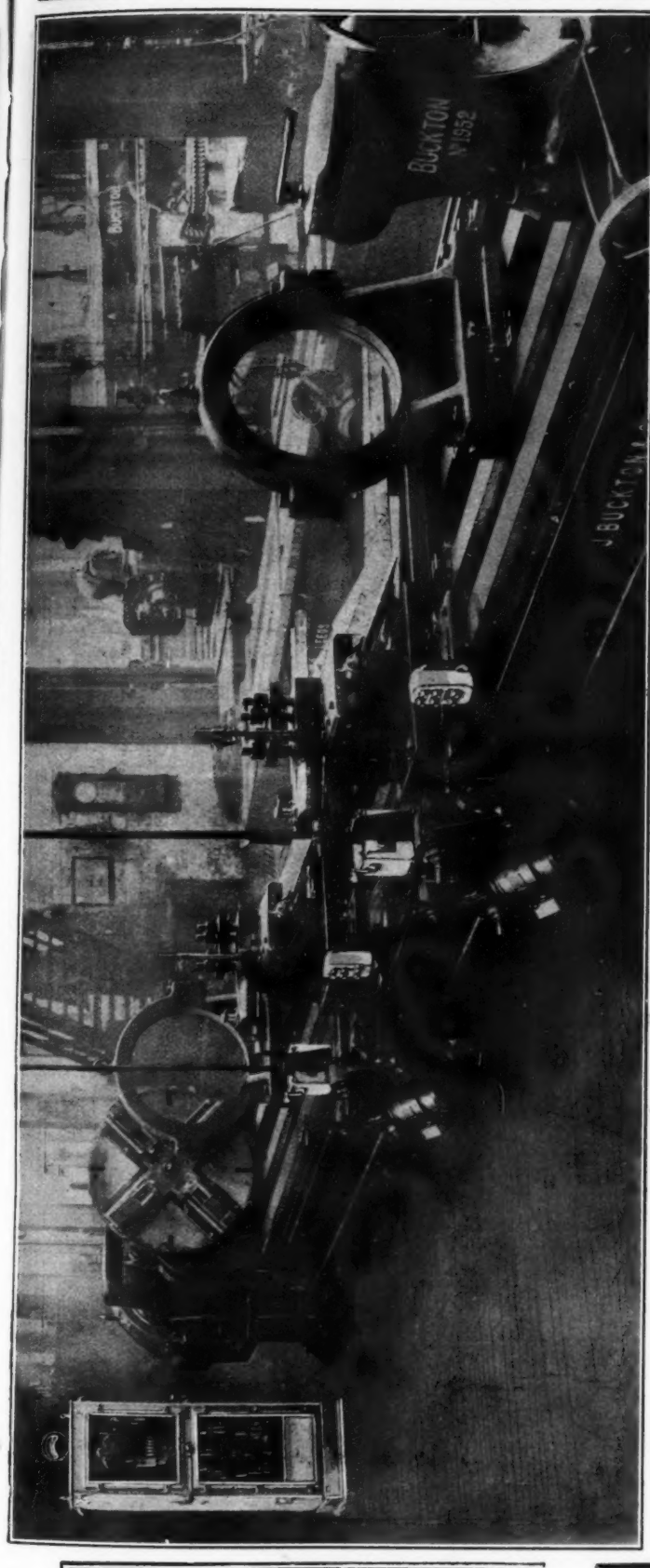
STOCK THEM NOW.

Branches : E. P. Prior, College Square North, BELFAST ; Cooper's Buildings, A., 2, Church Street, LIVERPOOL ; 83, Renfield Street, GLASGOW ; 18, Victoria Buildings, Deansgate, MANCHESTER.

Agents :
The Unity Lamp Accessories Ltd., 41, Call Lane, LEEDS ; 110, John Bright St., BIRMINGHAM.

Stella
ELECTRIC LAMPS

THE STELLA LAMP CO., LTD., Winchelsea Road, Harlesden, LONDON, N.W. 10.



Control Gear Notes

SOME interesting "Control" problems are presented by certain machine tools, such as the "Buckton" 22-inch centre Heavy Lathe shown on the left. This admits 40 feet between centres and weighs 40 tons, and illustrates excellently the type of machine tool where the size renders some form of automatic control almost essential.

A Heavy Lathe.

From the two operating positions at the lathe saddles, it is required to be able, on the one hand, to move the saddles themselves quickly in either direction, and on the other hand, to control the speed of the lathe from normal to high speed, and to give a single creeping speed both forward and reverse. The movement of the saddles is effected by small motors which can be clearly seen in the photograph, mounted on the saddles. Just above will be seen the corresponding starters, a single handle on each giving "forward" and "reverse" traverse at 18 feet per minute. In the case of small motors such as these, the mounting of both motors and switchgear in the operating position, gives the greatest possible convenience without the need for automatic control. The control of the main driving motor is from a large starting panel seen on the extreme left of the picture. This in turn is controlled by two 6-point push button stations which will be noticed on the lathe saddles. These stations embody the following push buttons: Creep, Reverse-creep, Start, Accelerate, Retard, and Stop.

The Control Gear.

The Control Gear for this heavy lathe was manufactured by Messrs. Brookhirst Switchgear Ltd., of Chester, and it will be of interest to describe briefly the main control panel. The Solenoid-type starter is controlled by an eddy current retarder, in place of the more usual oil dashpot. The advantage of this device is that the rate at which the starting operation takes place does not depend upon any arbitrary factor, such as temperature or the presence of dirt, but is dependent upon the starting load. This means that if for any reason the starting load is increased beyond normal, a longer time will be taken in starting—an ideal characteristic.

The design of the starter is such that a moving bar makes contact in turn with a number of spring-controlled carbon contacts. The action of the bar secures an immediate full-face butt contact on each successive step, in place of the sliding contact which is a feature of so many designs and which, by leading to "burning," often causes the starter to stick in an intermediate position. When the "stop" button is pressed, and the actuating solenoid is de-energised, the whole weight of the moving parts plus the pressure of the contact springs, secures a prompt return to "off," there being no sticking due to friction or otherwise.

Protective Features.

The motor is protected by a no-volt and overload release circuit breaker, and accidental contact with "live" parts is prevented by an isolating switch interlocked with the doors.

The features which have been briefly outlined above are of some importance, as they tend to promote reliability, which is of the first importance in any automatic control gear, but more particularly so in the case of a large lathe such as that illustrated. Further particulars of "Brookhirst" automatic control gears may be obtained by using the form below.

To
BROOKHIRST SWITCHGEAR LTD., CHESTER,
Please send me the Catalogues marked "X"

D.C. Hand Operated Control Gear .....
D.C. Automatic Control Gear .....
A.C. Hand Operated Control Gear .....
A.C. Automatic Control Gear .....

Firm.....
Address .....
.....
Attention of.....

BAILEY'S
'B.B.' Type GYROMETER
SHOWS SPEED AT A GLANCE IN REVS. PER MIN.

WE make all kinds of Indicators and Recorders for Pressures, Speeds, Level & Flow of Water, &c.

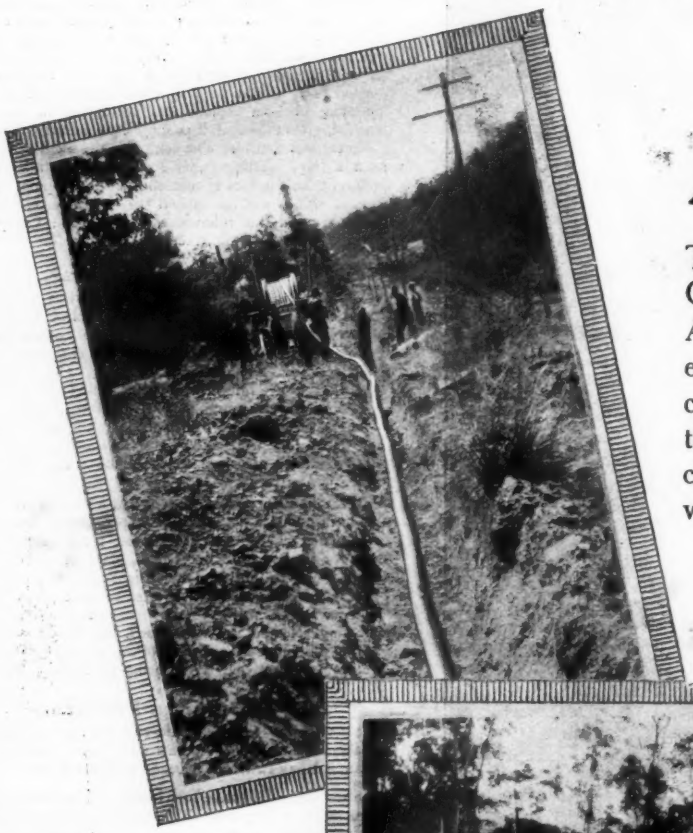
Air Compressors, Steam Pumps, Valves, &c.
ESTABLISHED 1839.
SIR W. H. BAILEY & CO., LTD., Manchester.

CABLES FLEXIBLES
LEAD-COVERED
T·R·S V·I·R

Ask for Samples
Ask for Prices.

CREDENDA CONDUITS CO., Ltd., OLDBURY, BIRMINGHAM.
Stocks also at London, Glasgow, Manchester, Leeds, Newcastle, Belfast, Grimsby, Hull.

PIRELLI-GENERAL CABLES



In The Antipodes.

The laying of Pirelli-General Cables in the Australian bush is striking evidence of the ever-increasing demand for electricity and the natural call for the cables of world-wide reputation.

TELEPHONE: SOUTHAMPTON 2141 (3 LINES).

PIRELLI-GENERAL CABLE WORKS, Ltd., SOUTHAMPTON.

TELEGRAMS: "PIGEKAYBEL, SOUTHAMPTON."

Proprietors: PIRELLI, LTD., and THE GENERAL ELECTRIC CO., LTD.

Awarded the Silver Medal.

The Clayton-Babcock Horizontal Cold Starting Heavy Oil Engine exhibited at the recent Royal Dublin Society's Show secured ***the only award***—Silver Medal.

Many leading oil engine makers were represented, and the gaining of this coveted trophy—after the closest investigation by such expert engineers—is further proof of the outstanding merits of the Clayton-Babcock Engine.

Among the many special and patented features are:—

Total absence of Air and Exhaust Valves, Valve Gear, &c.

A Cylinder Head of symmetrical design with detachable water jacket to facilitate the removal of chalk and other deposits—resulting in the entire elimination of fractures due to heat and casting strains.

A dust-proof detachable Crank-case Cover—a feature of special importance when the engine is to be installed for driving dairy machinery or where the engine-house is situated in dusty surroundings.

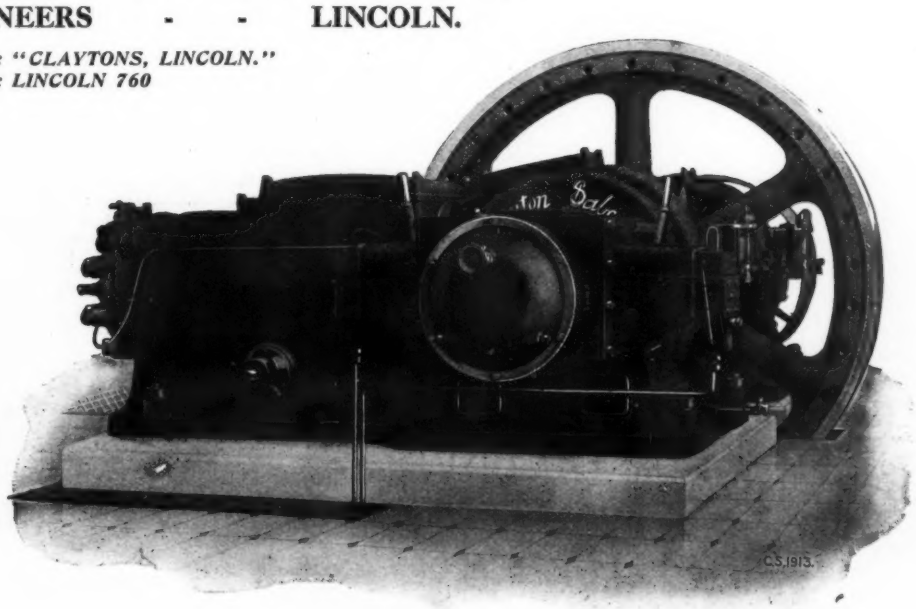
Maintenance and supervision charges are practically negligible, thus the total cost of running per B.H.P. per hour is lower than any other form of power.

Folder 421E gives some interesting Comparative Running Costs. Write for a copy.

CLAYTON & SHUTTLEWORTH, Ltd.,

ENGINEERS - - LINCOLN.

Telegrams: "CLAYTONS, LINCOLN."
Telephone: LINCOLN 760



Made in Sizes 30 B.H.P. to 150 B.H.P.

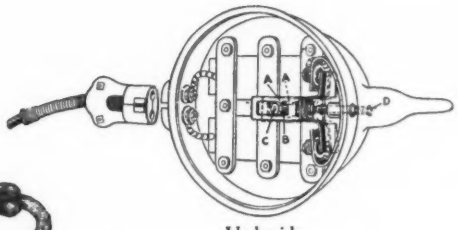
INSTAL CLAYTON-BABCOCK HEAVY OIL ENGINES

B

The JACKSON "SAFETY SWITCH" KETTLE

PATENT No. 255,942.

Kettle.



Underside.

The superiority and design of the construction of this Jackson "Safety Switch" Electric Kettle renders it an ideal kettle for hiring purposes.

The certainty with which the Safety Switch acts renders the Kettle absolutely damage proof if allowed to boil dry.

There are no plugs or fuses to be replaced and no skilled attention is required—just put some water in the kettle, press plunger in front, and the Safety Switch is reset.

Write for particulars.

THE JACKSON ELECTRIC STOVE CO., LTD.

143, SLOANE STREET, LONDON, S.W. 1.

'Phone: SLOANE 6248 (3 lines). 'Grams: COOKELEC, PHONE, LONDON.

Works: LUTON, BEDS.

Fuller Radio Accumulators

designed and built to give sustained service are available for —— every radio purpose ——

SW TYPES - - for Bright Valves.
SWD TYPES for Dull Emitter Valves.
The above supplied in Ebonite, Celluloid or Glass Containers.

SDG and LDG TYPES (Dry Charged) at popular prices, in Glass Containers, for Dull Emitter Valves.

RHG 20-volt High-Tension Batteries.

We strongly recommend any of the above to Radio users who appreciate a really high-class accumulator.

SDG GLASS CELL
25 A. Hours.
Price **5/6** Dry Charged.

LDG GLASS CELL
60 A. Hours.
Price **9/6** Dry Charged.

Both the above supplied ready for immediate use. We illustrate the SDG Type

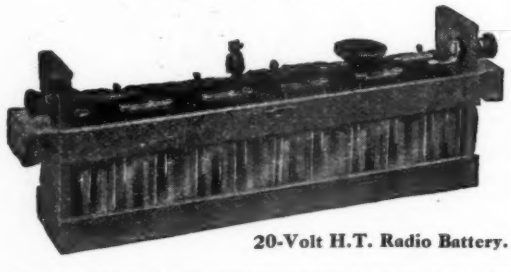
Reliable High Tension

The Fuller RHG 20-volt battery is offered as the most perfect H.T. unit available to-day.

Built up with separate glass cells and covers, thoroughly insulated against leakage and vibration; provided with non-corrodible main terminals and tapping terminals, and supplied in wood carrying grate, it meets the demand for a dependable battery at a moderate price.

Price 15/-

Tapping Clip and Funnel extra.



20-Volt H.T. Radio Battery.

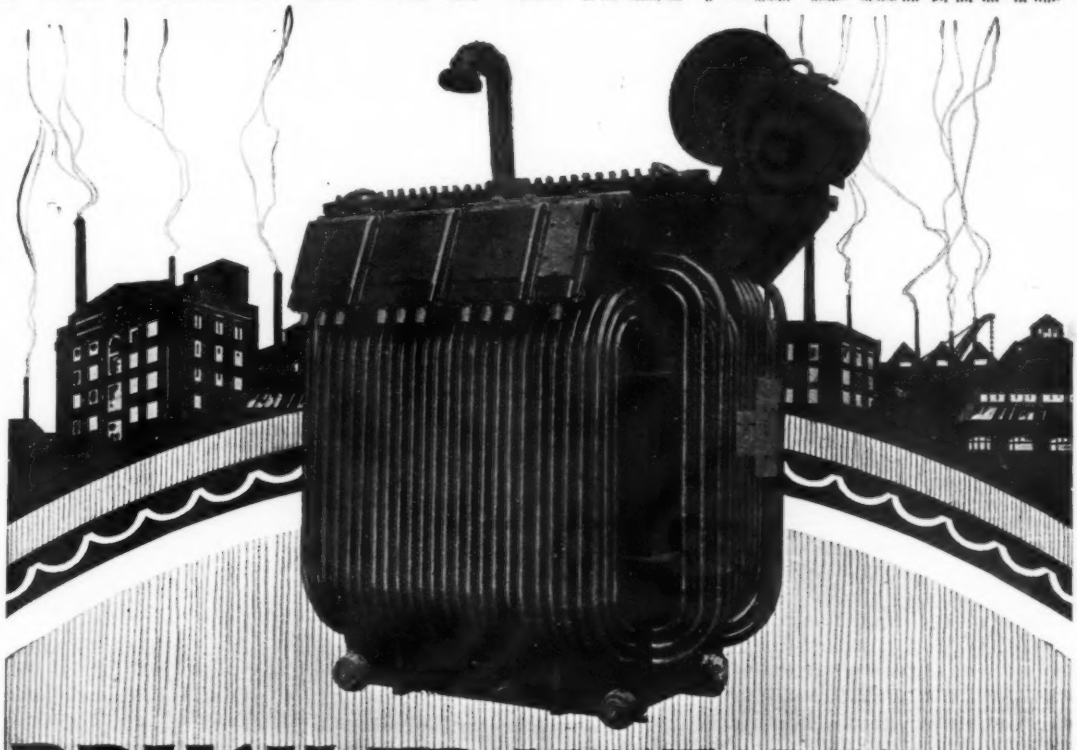
Fuller manufactures include, in addition to Accumulators for all purposes, the well-known "Sparta" Loud Speakers in Cabinet (cone) and Horn Types. Patent Inert and Dry Cells: H.T. Dry Batteries: Sack elements for Leclanche Cells, etc.

FULLER ACCUMULATOR COMPANY (1926) LTD.,

Telephone: Seven Kings 1200.
Telegrams: "Fuller, Chadwell Heath."

CHADWELL HEATH, ESSEX.

PRACTICAL EXPERIENCE BEHIND



BRUSH TRANSFORMERS

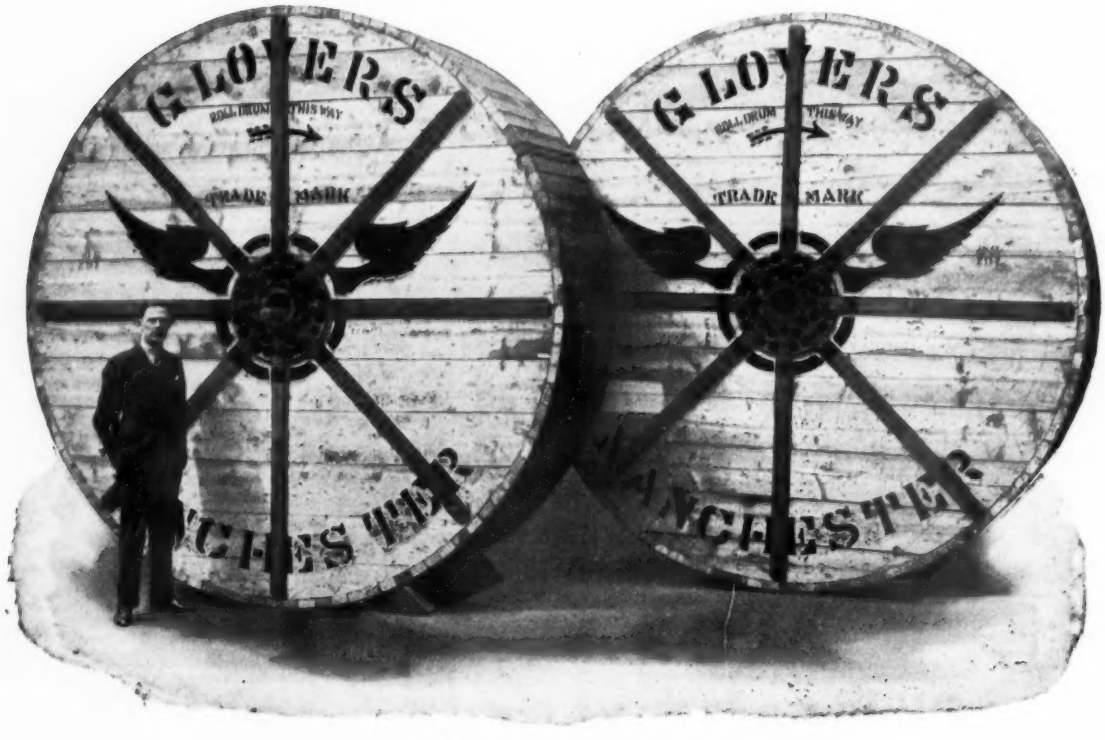
IN the design and construction of every Brush Transformer, there is an experience extending over a period of upwards of forty years.

Reliability, efficiency and good performance, under all conditions of load, are all characteristics of Brush Transformers, many hundreds of which are working in all parts of the world.

FALCON WORKS, THE BRUSH ELECTRICAL ENGINEERING CO. LTD. LOUGHBOROUGH.

GLOVER'S
SUPER-TENSION CABLES

No occluded gases to be ionised.
No bleeding or draining under load.
No migration of impregnating media under stress.
No expansion troubles.



11 Ton Drums.

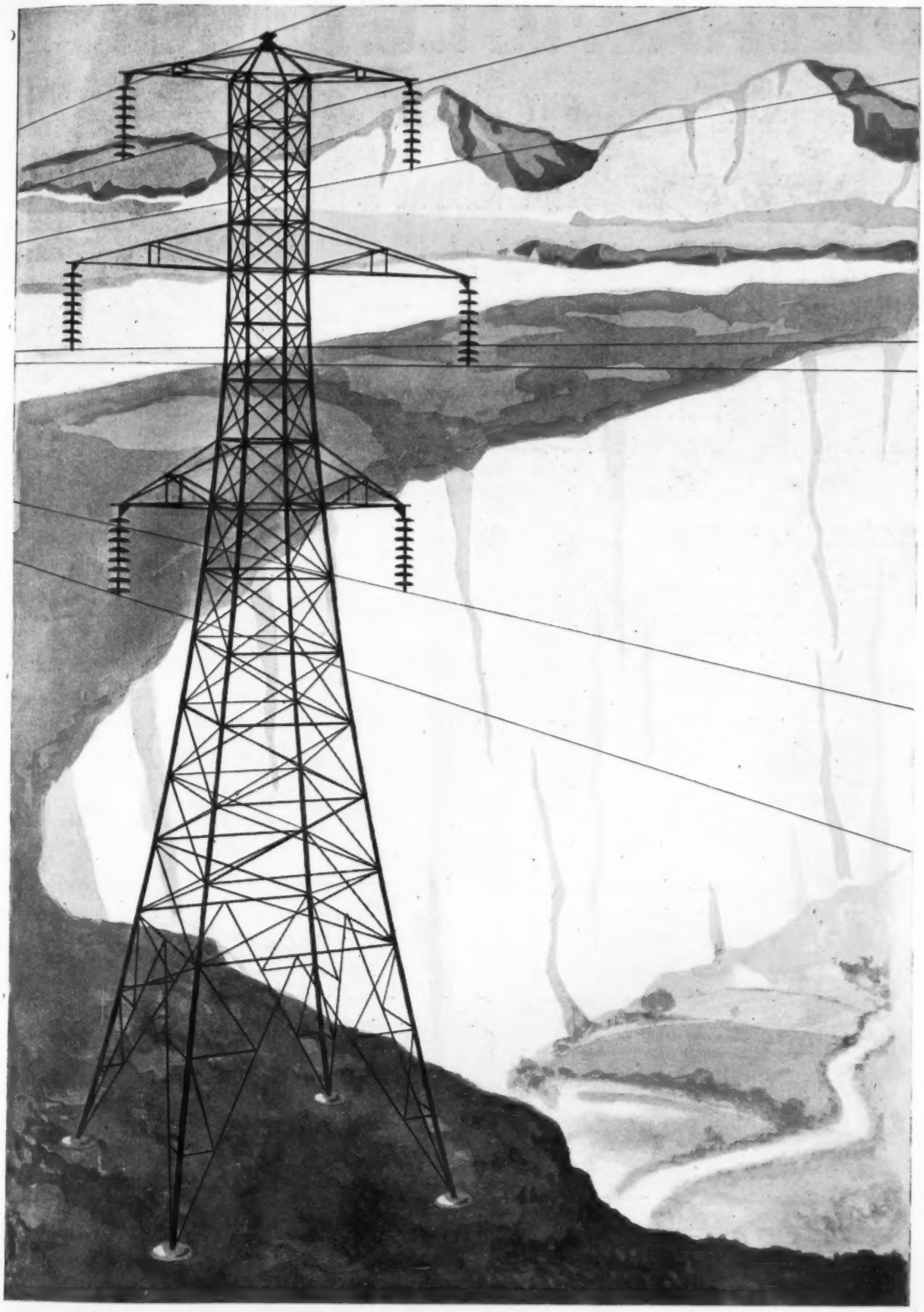
Made in the

3-CORE { BELTED
SINGLE SCREENED
NON-FIBROUS FILLED

or

SINGLE CORE TYPES.

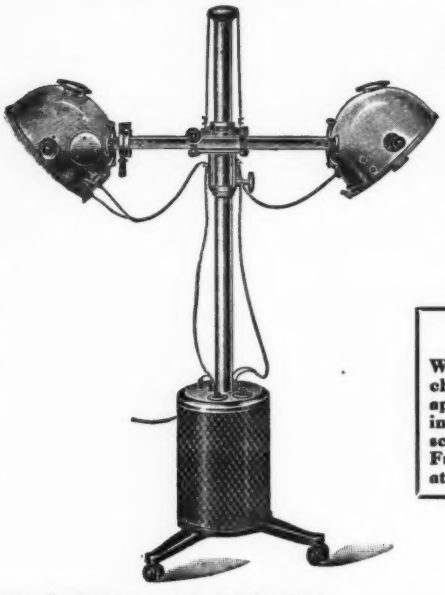
W. T. GLOVER & CO., LTD.,
TRAFFORD PARK ❧ ❧ MANCHESTER.



WATSHAM'S LTD

WINDSOR HOUSE, VICTORIA STREET, WESTMINSTER, LONDON, S.W.1

ULTRA-VIOLET LIGHT



BUY DIRECT FROM THE MAKERS

Send for Catalogue No. 29

WARNING !

We would urge that intending purchasers of any ultra-violet light apparatus (small or large) should insist on examining by a spectroscope the apparatus concerned. Full facilities for this are given at our showrooms.

THE "MEDISUN" U-V. APPARATUS

Running Cost : 30 Treatments for Threepence.

The "MEDISUN" Ultra-Violet Light Apparatus is of the quartz mercury vapour type. It has been so designed as to eliminate all unnecessary expense, and yet provide an efficient source of ultra-violet radiation, quick in its reaction speed, not requiring adjustment, and foolproof in its mechanical details.

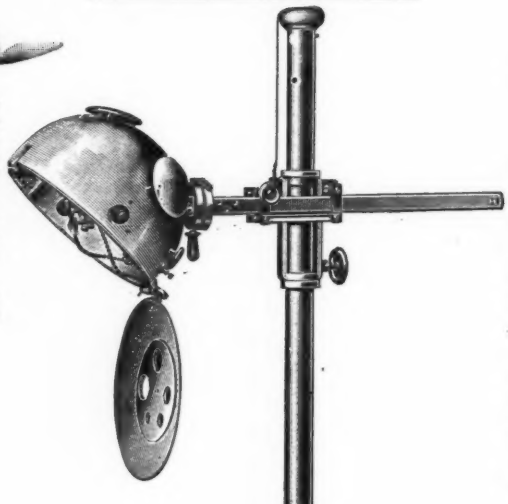
Whilst the price of the "Medisun" is quite low, its appearance is really first-class. Manufactured in polished aluminium throughout, it does not require frequent cleaning, is designed to stand on any table, weighs only 14 lbs., and is a thoroughly reliable piece of apparatus.

PRICE, for use on direct current - **£10**
PRICE, for use on alternating current **£18**

THE "TRINITY" U-V. APPARATUS

Designed to provide the radiation of Tungsten Arc, Carbon Arc, and Mercury Vapour Arc, so providing a selection of radiations at the will of the operator. Both lamps can be run simultaneously when desired, permitting of two or more patients being treated at the same time.

PRICE, for direct current **£41 : 0 : 0**
PRICE, for alternating current **£53 : 12 : 0**



WHOLESALE RETAIL EXPORT

BRITISH MADE THROUGHOUT

THE "SUNBEAM" U-V. APPARATUS

Designed for HOME USE, the Quartz Mercury Vapour Burner is less powerful than our other Models and consumes less current.

PRICE, for use on direct current **£17 : 0s.**
PRICE, for use on alternating ,, **£29 : 10s.**

THE Dr. PERCY HALL U-V. APPARATUS

Unquestionably the most popular model for PROFESSIONAL USE, fitted with Quartz Mercury Vapour Burner, and mounted on a well engineered stand, providing all the necessary adjustments for local or general applications.

Designed by a Doctor for the use of Doctors.

PRICE. for use on direct current - - **£35**
PRICE, for use on alternating current **£51**

THE "JESIONEK" U-V. APPARATUS

Designed for whole body and group treatments only.

Suitable for SCHOOLS, HOSPITALS, INSTITUTIONS, BATHS, ETC.

PRICE, for use on direct current **£31 : 0 : 0**
PRICE, for use on alternating ,, **£44 : 0 : 0**

WE CAN SUPPLY ALL MODELS FROM STOCK

THE MEDICAL SUPPLY ASSOCIATION LTD.

Actual Makers of Ultra-Violet Radiation Apparatus of every Type.

167—185, GRAY'S INN ROAD, LONDON, W.C.1.

Telephone: TERMINUS 5432 (6 lines).

TO THE TRADE. We are the ACTUAL MANUFACTURERS of ALL KINDS of X-RAY and ELECTRO-MEDICAL APPARATUS and INVITE YOUR ENQUIRIES. Catalogues covering complete range of apparatus, with trade terms, post free.

THE ALPHABET OF INSTRUMENT MANUFACTURE.

A ccelerometers.
mmeters.
nemometers.
veraging Recorders.

B arometers.
ridges.

C ell Testing Voltmeters.
ondensers.
ontroller Instruments.

D etectors.
irectional Revolution Indicators.

E lectrical Speed Indicators.
ngine Indicators.

F ault Localising Apparatus.
ire Control Apparatus.
requency Meters.
uses. (Sparklet).

G alvanoscopes.
alvanometers.
auges.

H eight Indicators.
orse Power Indicators.

I dle Current Ammeters.
dle Current Wattmeters.
nkers. (Morse).
nsulation Test Sets.

J unction Boxes.

K eys.

L atascale Instruments.
eakage Indicators.
ightning Conductor Test Sets.
ogs. (Ships).

M agneto Generators.
arine Instruments.
illiammeters.
illivoltmeters.

N aval Instruments.

O hmmeters.
ptical Instruments.

P ower Factor Indicators.
otentiometers.
ressure Detectors.

Q uadruplex Repeater Sets.

R ail Bond Test Sets.
ecorders.
esistances.
evolution Counters.

S hunts.
ounders.
peedometers.
urveying Instruments.

T achometers.
elegraph Apparatus.
hermo Instruments, Couples.
est Sets.
ransformers (Instrument).

U niversal Shunts.

V oltmeters.

W attmeters.

X perimental Work.

Y oung's Speed Indicators.

Z eroising Devices.

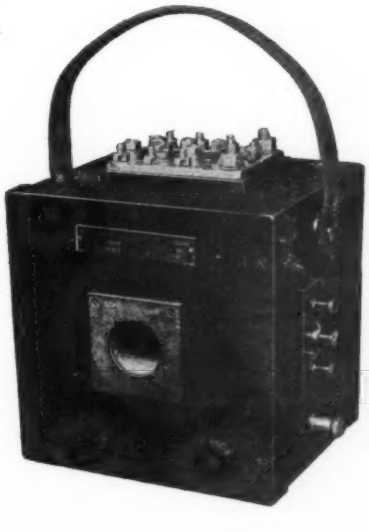
TRANSFORMERS

CURRENT TRANSFORMERS with nickel-iron alloy core, supplied in single or multiple ranges. For measurements of the highest precision.

Ratio Variations less than 0.1%, down to 1/10th current.

Phase Angle not exceeding 3 minutes, down to 1/10th current.

Indispensable as standards, and for checking purposes.



ELLIOTT BROTHERS (LONDON) LIMITED, CENTURY WORKS, LEWISHAM, S.E. 13. ESTABLISHED 1800.

IN ASSOCIATION WITH

SIEMENS BROTHERS & Co LIMITED, WOOLWICH, LONDON, S.E.18. ESTABLISHED 1858.

S. & C. Three-Phase Induction Regulator.

SWITCHGEAR AND INDUCTION REGULATORS

THE LATEST developments in design and construction are embodied in S. & C. Induction Regulators.

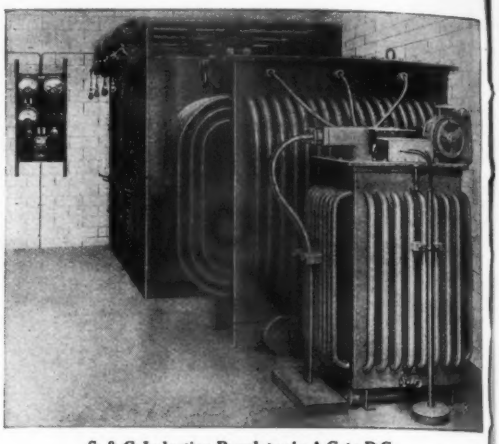
Whether the problem is the Voltage Control of Feeders, Ring Mains, and Interconnectors between Generating Stations, or the control of Rectifiers or Rotary Convertors, there is an efficient, simple, and reliable S. & C. Induction Regulator to suit the particular conditions, Polyphase or Single Phase. *(S. & C. Single Phase Regulator Pat. No. 263615.)*

Send for Catalogue Section No. 27, a treatise of 28 pages describing all forms of Induction Regulators and illustrating the many features of superiority developed and patented by

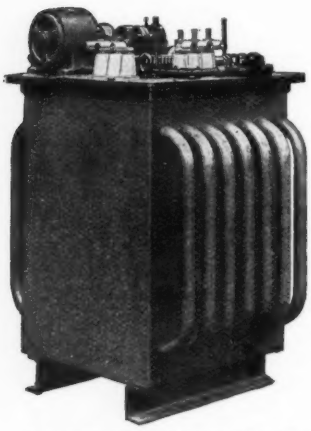
SWITCHGEAR & COWANS Ltd
Old Trafford Manchester

District Offices and Representatives throughout Great Britain and Overseas.

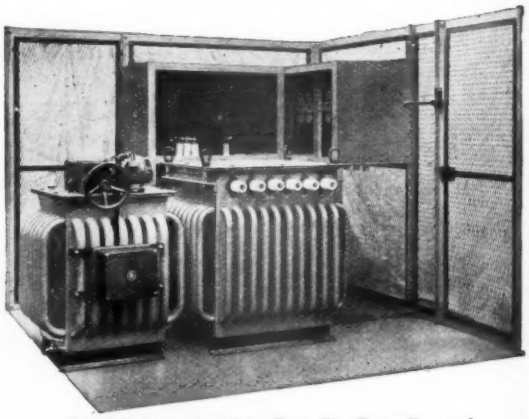
LONDON OFFICE: 28, Victoria St., S.W.1



S. & C. Induction Regulator in A.C. to D.C. Converter Sub-station.

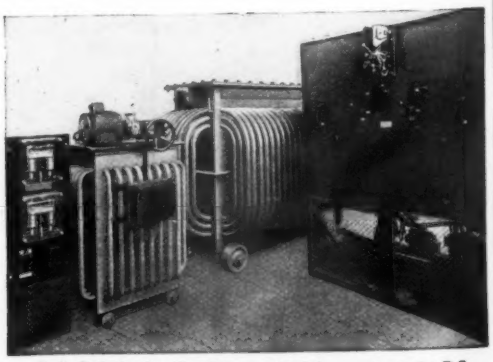


S. & C. Three-Phase Induction Regulator.



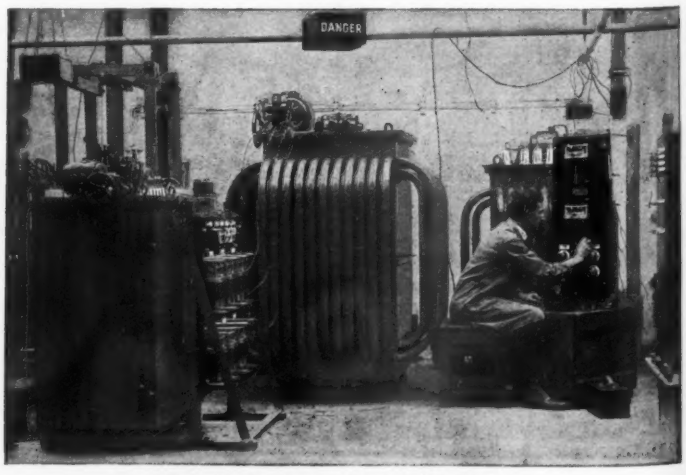
S. & C. Induction Regulator Controlling Power Factor of Interconnector between Generating Stations.

S. & C. Single-Phase Induction Regulator.



S. & C. Induction Regulator maintaining constant the D.C. Voltage of Mercury Rectifier (*Hewittic Electrical Co., Ltd.*).

S. & C. Three-Phase Induction Regulator and Control Panel.



Induction Regulators on Test in S. & C. Works.

D.R.K. 155.

In the Strand

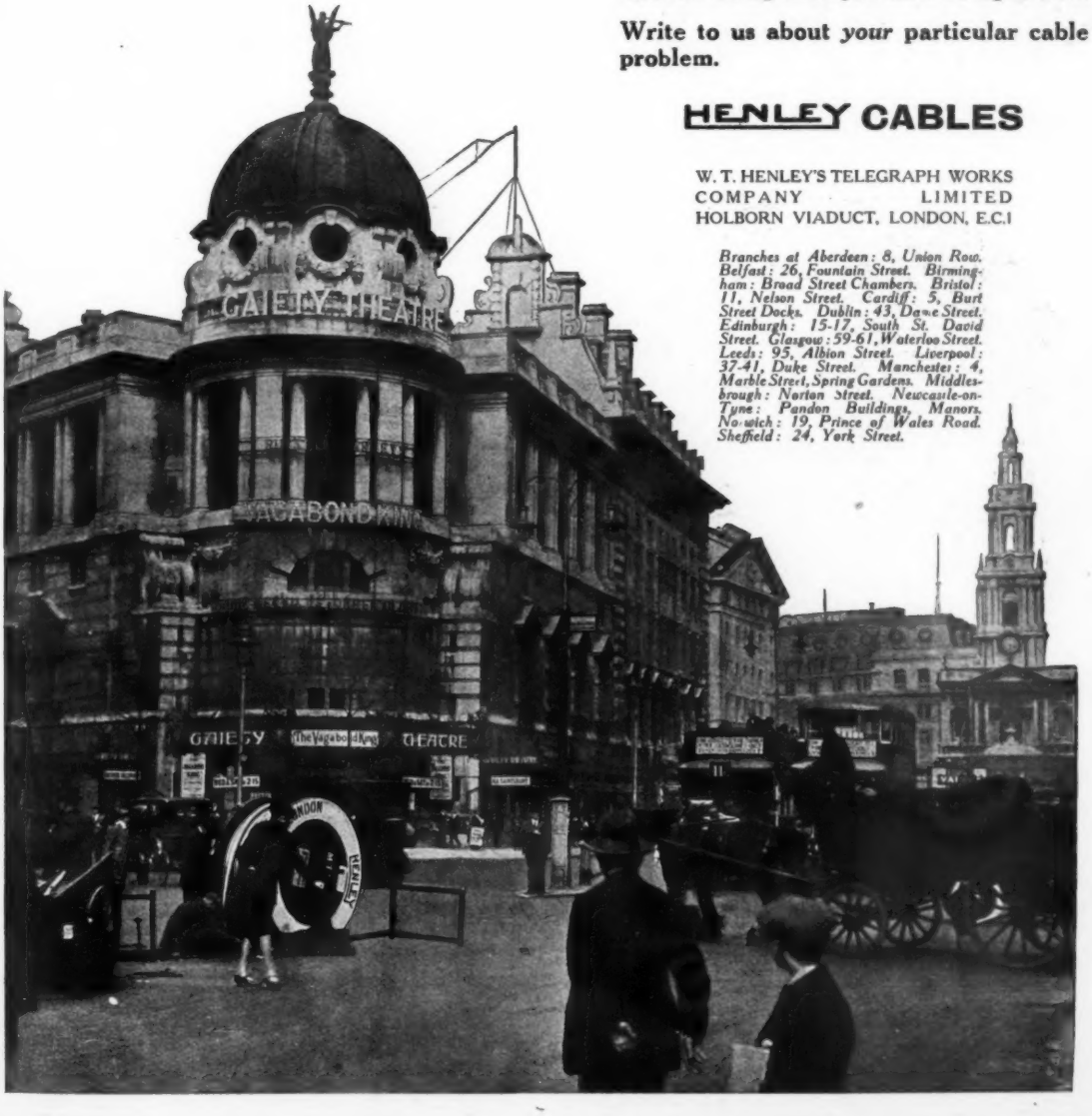
A famous cable in a famous thoroughfare! The photograph reproduced below was taken on Thursday, April the 26th, 1928, and shows Henley Telephone Cable being drawn into a Post Office man-hole opposite the Gaiety Theatre.

Henley Cables of all types have been laid in many famous quarters of London Town and in countless places all over the world.

Power cables for all voltages—Submarine power and dry-core cables—varnished cambric cables, etc., etc.

Electrical men in all countries know the reputation of Henley Cables. A reputation for doing their job and doing it well.

Write to us about *your* particular cable problem.



HENLEY CABLES

W. T. HENLEY'S TELEGRAPH WORKS
COMPANY LIMITED
HOLBORN VIADUCT, LONDON, E.C.1

Branches at Aberdeen: 8, Union Row. Belfast: 26, Fountain Street. Birmingham: Broad Street Chambers. Bristol: 11, Nelson Street. Cardiff: 5, Burt Street Docks. Dublin: 43, Dame Street. Edinburgh: 15-17, South St. David Street. Glasgow: 59-61, Waterloo Street. Leeds: 95, Albion Street. Liverpool: 37-41, Duke Street. Manchester: 4, Marble Street, Spring Gardens. Middlesbrough: Norton Street. Newcastle-on-Tyne: Pandon Buildings, Manors. Norwich: 19, Prince of Wales Road. Sheffield: 24, York Street.

THE "KING SOL" BOWL FIRE.

A wider area of heat distribution than usual is obtained with the "KING SOL" Bowl Fire due to the particular form of reflector. The element is of the highest grade and designed to give lasting service. It is of the plug-in pattern, and in case of need can be removed without interference with the guard.

D.S. 451.

The reflector is solid copper and permits easy cleaning on account of the novel design of element guard. Maximum efficiency is thus retained.
The "KING SOL" Bowl Fire has a pleasing appearance—is a quick seller and good profit-earner for the Contractor and Wholesaler.
Write for copy of list with terms.

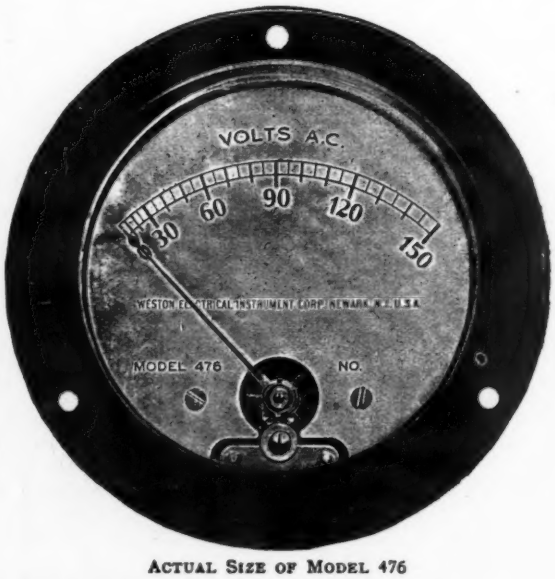
Packed in strong Cartons.

List No. D.S. 450, 10" Bowl, **21/-**
" " D.S. 451, 12" " **22/6**
Complete as illustrated.

Deliveries from Stock.

BERRY'S ELECTRIC, LTD.

LONDON:
86 and 88, Newman Street, W.1.
BIRMINGHAM:
Ironclad Works, Hall Green.
MANCHESTER:
6, Deansgate.



Actual Size of Model 476

MODEL 476.

Case Diam.:	2·56"
Flange Diam.:	3·25"
Depth:	1·63"
Scale length:	2"

MODEL 517.

Case Diam.:	2·06"
Flange Diam.:	2·56"
Depth:	1·72"
Scale length:	1·5"

List Price from 40s.

ANOTHER WESTON TRIUMPH

SMALL PANEL INSTRUMENTS FOR ALTERNATING CURRENT

These New Models create a new standard for small A.C. Instruments, and are in a class alone for design, performance and finish.

They can only be compared with our well-known Models 301 and 506, for D.C. service, and we are confident that their performance under the severest service conditions will quickly gain for them the same reputation that our small D.C. Models have held ever since their introduction some years ago.

THE SPECIAL FEATURES OF THESE TWO NEW MODELS ARE:

Low Power Consumption. **Excellent Damping.**
High Sensitivity, *i.e.*, 6 mA for 300 volt range and approximately 9 mA for 150 volt range.
Accuracy 2 per cent. for A.C. (commercial frequencies), and also suitable for D.C. circuits.
High Self-Contained Range, *i.e.*, up to 300 volts.
Legible Scale. **Weston Manufacture.**

A study of the design and manufacture of these New Models will prove them to be typical Weston products carrying Weston guarantee for accuracy and reliability under the worst service conditions.

We believe that the exceptional merits and neat design of these New Models will appeal to the many users of Weston Instruments who have frequently felt the need of a reliable, small, and inexpensive instrument for A.C. service.

Weston Electrical Instrument Co., Ltd.,
15, Great Saffron Hill, London, E.C.1.

Telephone: Holborn 2029. *Telegrams: "Pivoted Smith London."*

The Ideal Fan for every purpose is the Verity "Orbit"

The Verity "Orbit" is scientifically designed.

It is as effective as a fan can possibly be.

The blades revolve in a double oscillating movement, horizontal and vertical—the circle of oscillation forming an ellipse.

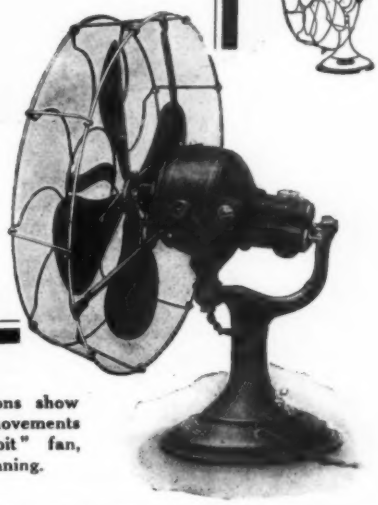
The "Orbit" can be supplied for ceiling, desk or wall fixing, and for alternating or direct current. It is robust in construction, and has an enviable reputation for reliability.

VERITYS

LIMITED

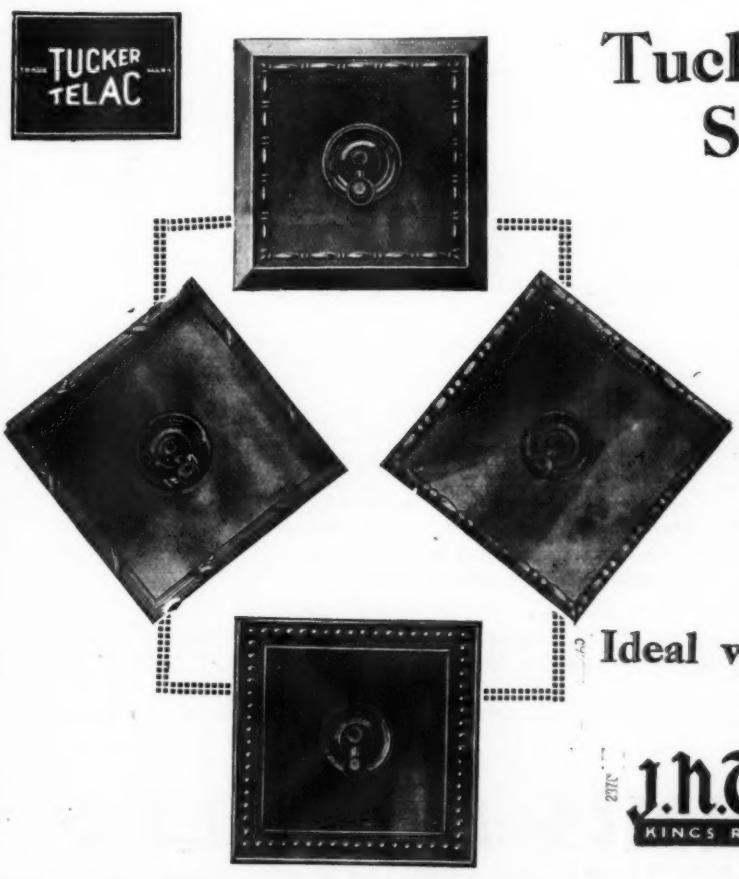
ASTON - BIRMINGHAM

Telephone : East 805. Telegrams : "VERITY, BIRMINGHAM."



The illustrations show the various movements of the "Orbit" fan, when running.

TUCKER TELAC



Tucker Switchplates

The finished effect of an installation is of the greatest importance to the woman in the home.

If it reflects taste and refinement, she will no doubt put it down to her own excellent choice and discrimination; at the same time, she will remember, and most probably broadcast the name of the Contractor who carried out the work; therefore, when submitting designs and samples, do not overlook Tucker Switchplates—their appearance is so distinctive, so refined, so different, that they immediately create the desired impression.

Ideal with Tucker Switches

J. H. Tucker & Co. Ltd.

KINGS Rd TYSELEY BIRMINGHAM

—if you install the NEW BENNIS FORCED DRAUGHT CHAIN GRATE

THE efficient burning of anthracite duff has for many years presented an insoluble problem. It is so no longer. As a result of two years' continuous experimenting, the new "Bennis" Chain Grate, forced draught, compartmental type, with the new slab link is now raising steam from this low-grade fuel and repeat orders have already followed upon its success.

¶ The new grate is provided with compartments, each with its own draught control and owing to the special air-distributing arrangements—for all of which patents have been applied for—the grate will burn not only ordinary anthracite duff but, as in a recent instance, duff which has been on the pit heap unused and unusable for thirty years. Incidentally, it will burn all cokes produced by low temperature carbonisation, which can be used hot or cold; steel works waste coke ballast, gas works coke breeze and dust, coke oven sweepings, etc., with excellent results.

¶ At a Colliery in Carmarthenshire using the special "Bennis" Chain Grate on a Water Tube Boiler we obtained an evaporation of approximately 30% in excess of their previous figures when using washed peas. The material burnt was anthracite waste duff which went through a mesh of $\frac{1}{8}$ in. with a calorific value of from 9,000 to 10,000 B.T.U.'s and an ash content of 15 per cent.

We guarantee that the "Bennis" methods of combustion will give better results than any other system known.

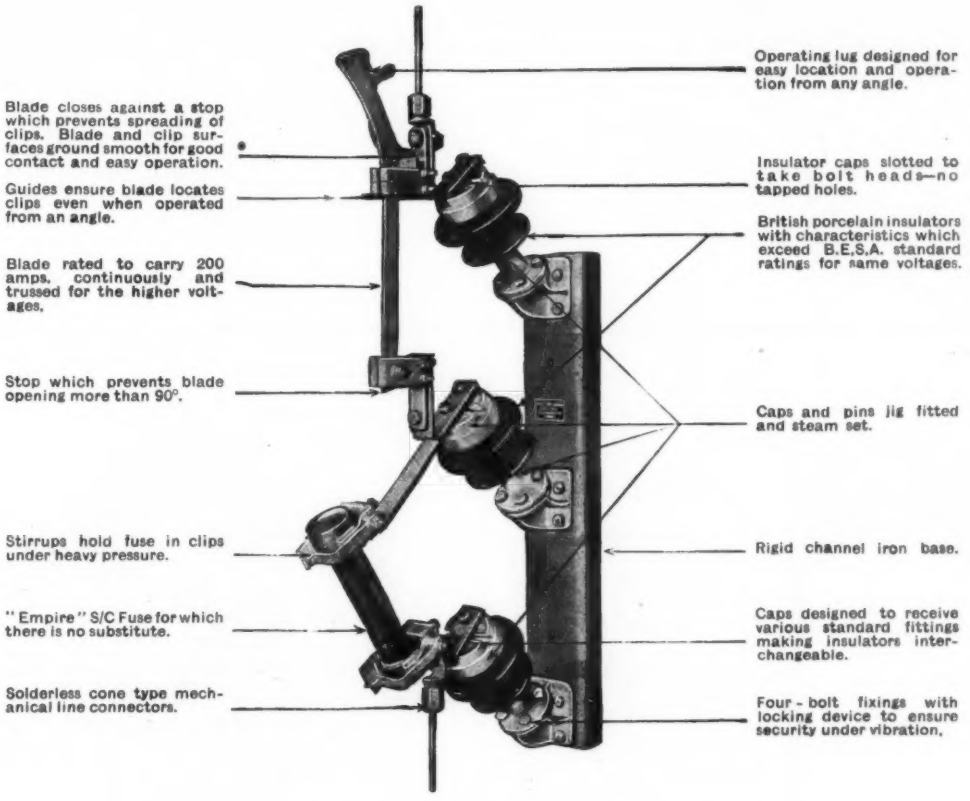
Full information can be had for the asking.

ED. BENNIS & CO., LTD

LITTLE HULTON • BOLTON ▪ London Office: 28 Victoria Street, S.W.1

Empire Overhead Line Equipment

THIS UNIT IS TYPICAL OF THE HIGH QUALITY OF "EMPIRE" EQUIPMENT.


Operating lug designed for easy location and operation from any angle.
Blade closes against a stop which prevents spreading of clips. Blade and clip surfaces ground smooth for good contact and easy operation.
Insulator caps slotted to take bolt heads—no tapped holes.
Guides ensure blade locates clips even when operated from an angle.
British porcelain insulators with characteristics which exceed B.E.S.A. standard ratings for same voltages.
Blade rated to carry 200 amps. continuously and trussed for the higher voltages.
Stop which prevents blade opening more than 90°.
Caps and pins jig fitted and steam set.
Stirrups hold fuse in clips under heavy pressure.
Rigid channel iron base.
"Empire" S/C Fuse for which there is no substitute.
Caps designed to receive various standard fittings making insulators interchangeable.
Solderless cone type mechanical line connectors.
Four-bolt fixings with locking device to ensure security under vibration.

All current carrying parts cadmium plated. All steel work hot galvanised after all machine processes completed.

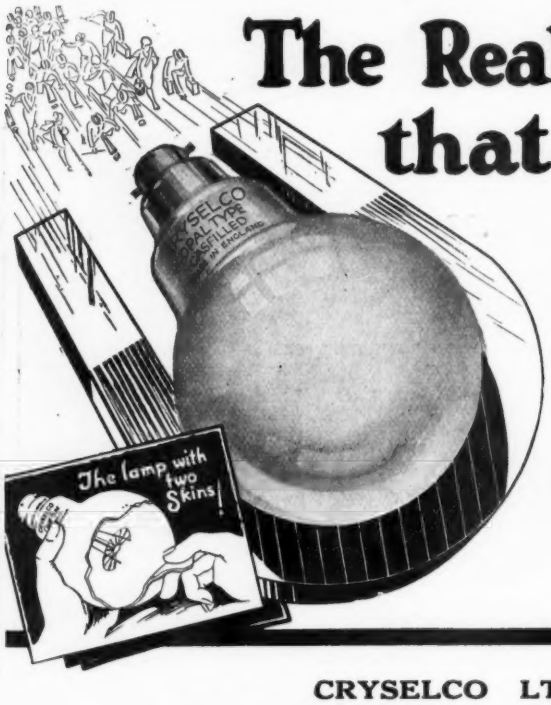
Standard designs for vertical, horizontal or underhung mounting with or without fuse and choke coil.

There is no substitute for the Empire S&C Fuse

ELECTRIC CONTROL LIMITED, GLASGOW

Birmingham, Leeds, London, Manchester, Newcastle, Swansea, South Africa, Australia, Canada, New Zealand

EMPIRE ELECTRIC CONTROL



The Real Glareless Lamp that attracts Trade

THE CRYSELCO OPAL—

The Lamp with Two Skins—attracts and holds.

Customers are interested in the fact that it has two skins, the inner of clear Crystal Glass and the outer of the finest, most translucent opal. Just mention these facts to your clients and you will see how interested they become and how readily they order. Then you will find how quick and efficient is our service, not only for the supply of the Cryselco Opal, but for the whole range of Cryselco Lamps made *for every lighting purpose under the moon!*

Full Particulars, Catalogues, Price Lists, Showcards, Cut-Outs FREE on request.

CRYSELCO OPAL

CRYSELCO LTD., KEMPSTON WORKS, BEDFORD.

Telegrams: "*CRYSELCO, KEMPSTON.*" *Telephone:* "*BEDFORD 327718.*

HOME BRANCHES:

BRIGHTON: 35, Duke Street. 'Phone: Brighton 5512.

BIRMINGHAM: 21-22, Newspaper House, 164, Corporation Street. 'Phone: Central 3741.

GLASGOW: 23, Douglas Street. Telegrams: "Starter, Glasgow." 'Phone: Central 1258.

LONDON: Thanet House, 231-2, Strand, W.C. 2. Telegrams: "Cryselco, Estrand, London." 'Phones: Central 8016-7-8.

NEWCASTLE-ON-TYNE: 27, Grey Street. Telegrams: "Cryselco, Newcastle-on-Tyne." 'Phone: Central 3295.

BRISTOL: All Saints' Chambers, 41, High Street. 'Phone: Bristol 8069.

LEEDS: 11, New Station Street. Telegrams: "Cryselco, Leeds," 'Phone: Leeds 27866.

MANCHESTER: Douglas Chambers, Corporation Street. Telegrams: "Cryselco, Manchester." 'Phone: City 9190.

CARDIFF: 80, Charles Street. 'Phone: Cardiff 7466.

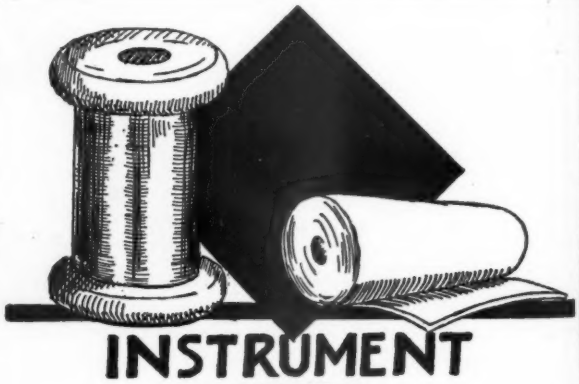
B.N.B.

Follow the lead of Power Station Engineers by using OASIS ACCUMULATOR ACID

THEY *must* use the purest acid obtainable, because the efficient working of the plant depends upon the acid.

THAT is why they choose Oasis Acid. Oasis, tested at every stage of its manufacture, always conforms to the highest standard. You can depend upon it. And it is delivered carriage paid at *OUR RISK in U.K.*

THE GENERAL CHEMICAL AND PHARMACEUTICAL CO., LTD., WILLESDEN, LONDON, N.W.10.



INSTRUMENT WIRES

Enamelled, Cotton & Silk Covered.

Our specialities include every description of

INSULATING MATERIAL

BAKELISED SHEETS: DELLITE, RADIOLITE, ASBESTITE, CANEVASITE, MICANITE, AMBERITE, MICAFOLIUM, MICA TAPES, OIL CLOTH, SILK, PAPER AND PRESSPAN, MOULDED PIECES OF ALL KINDS IN MICANITE & BAKELITE, HEAT RESISTING PLATES, ETC.

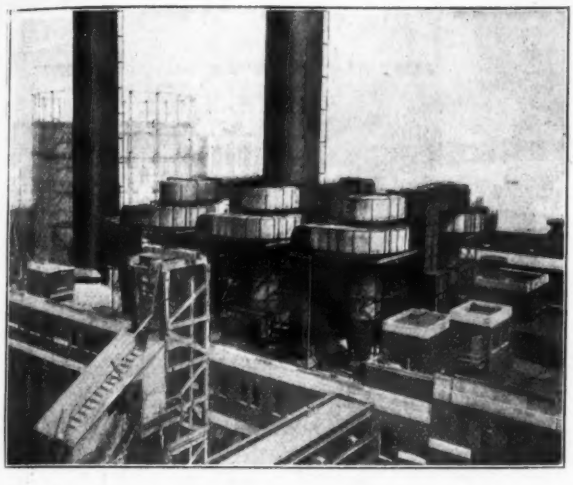
First-Grade Materials. Competitive Prices. Prompt Delivery.

WEST INSULATING

COMPANY LIMITED

123 VICTORIA ST., GRAMS. ETILUR, SOWEST. LONDON. S.W.1. PHONE. VICTORIA 1521.

TRADE SIROCCO MARK



Grit Collection

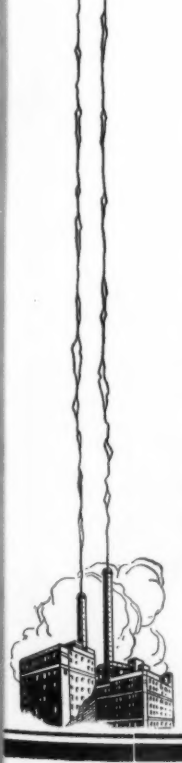
at the East River Power House of the New York Edison Company, New York, is carried out by

Six Davidson Flue Dust Collectors

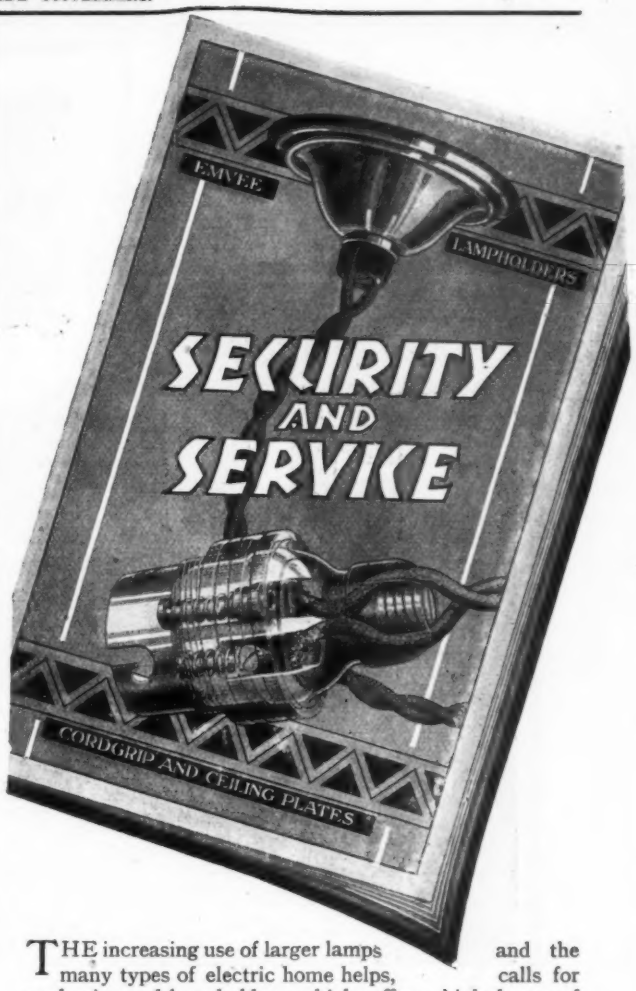
[Made by the American Blower Corporation, Detroit.]

Davidson Flue Dust Collectors possess not only a high collecting efficiency but catch dust that will pass through a 325 mesh screen.

DAVIDSON & CO. LIMITED.
Sirocco Engineering Works.
BELFAST



The East River Station of the New York Edison Co. of New York will have a total capacity of 1½ million kilowatts.



THE increasing use of larger lamps and the many types of electric home helps, calls for cord-grips and lampholders, which offer a high degree of security against faults and give long service under strenuous conditions. Such are the features of "Emvee" Lampholders, Cordgrips and Ceiling Plates, as instanced by the following points:—

SECURITY.

The "Emvee" Cord-grip is made to support 56 lbs. without injury to the insulation and there is no fear of leads breaking at the point of entry.

SERVICE.

The "Emvee" Lampholder is made to carry heavy currents, it saves time in wiring, it resists corrosion, and it is made in types for *every* kind of installation.

PRICE.

Built up to a standard and not down to a price, the "Emvee" Lampholder is nevertheless low in price. Prices have recently been reduced.

For full description and prices, send for your supply of the new leaflet 4130/1 as shown above, overprinted with your own name and address.

EMVEE LAMPHOLDER & Cordgrip

METRO-VICK SUPPLIES, LTD.,
(Proprietors: Metropolitan-Vickers Electrical Co., Ltd.),
155, CHARING CROSS ROAD, LONDON, W.C.2.

8D

FULLER
TRANSFORMERS

Backed by over 30 years' experience

FULLER ELECTRICAL & MFG CO (ASSOCIATED WITH SWEDISH GENERAL ELECTRIC LTD) 5, CHANCERY LANE, LONDON WC2
TELEPHONE HOLBORN 6001 (5 LINES) TELEGRAMS: FULLMAGE FLEET, LONDON.

Some Outstanding Merits of "Metrovick" Type NA. Prepayment Meters

INTERCHANGEABILITY.
Jig-made parts interchangeable with other Type NA meters avoids need for large stock of parts.

EASY PRICE CHANGE.
The rate per Unit can be changed in two minutes on site by an unskilled man.

LIGHT WEIGHT.
Weighs only 18 lbs.
SIMPLE WIRING
Exactly similar to that of standard meter.

GOOD WORKMANSHIP.
Sound materials. High grade workmanship, inspection and finish throughout.

METROPOLITAN Vickers ELECTRICAL CO LTD
TRAFFORD PARK - - MANCHESTER.

G
P19

GAS BEATEN!

The ingenuity of THE REVO ELECTRIC CO. is clearly demonstrated by the fact that again they are well ahead of all other makers by placing on the market the

PATENT INDESTRUCTIBLE "Revo" **SUPERSPEED BOILING PLATE**

THE QUICKEST PLATE IN THE WORLD

SHOCK PROOF

INDES-TRUCTIBLE

FOR USE WITH REVO ELECTRIC COOKERS.

A RECORD Number of Orders for Revo Electric Cookers with these Plates were booked at the I.M.E.A. Exhibition, Bath. **Send us your Enquiries.**

IN OPERATION IT WILL BOIL

1 PINT in UNDER 3 MINUTES

Further particulars from—

REVO ELECTRIC CO., LTD.,
TIVIDALE, TIPTON, STAFFS.

Telephone:—TIPTON 131-134. P.B.Ex. Telegrams:—REVO TIPTON.

BRANCHES: LONDON: 28, Shoe Lane, E.C.4. 'Phone: 9028/9 Cent. 'Grams: Revolect, Lud London.
GLASGOW: 73, Robertson St. 'Phone: 5219 Cent. 'Grams: Revo, Glasgow.
NEWCASTLE-ON-TYNE: 22, Oxford St. 'Phone: 3688 Cent. 'Grams: Revo, Newcastle-on-Tyne.
CARDIFF: 5, St. Andrews Cres. 'Phone: 5269 Cardiff. 'Grams: Revolect, Cardiff.

F

one of the J.&P. pages

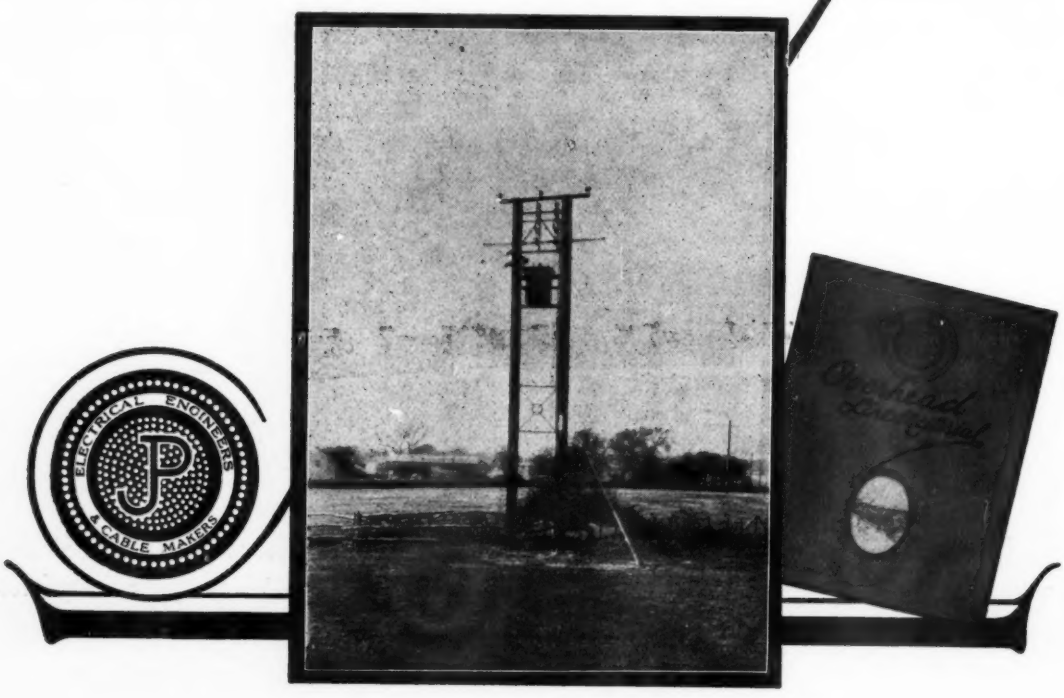
New Life for the Land

There is no more urgent problem than that of arresting the decay of British agriculture, and the only solution is the application of modern methods and modern amenities to life on the farm.

The telephone, the motor-car, the cinema and wireless, have already done much to stem the flight from the village to the town. Electric light and electric power will do even more important work when they are everywhere available for application to the hard economic problems the farmer has to face.

Engineering — the product of modern times — has come to the rescue of agriculture, the industry of immemorial ages.

Our photograph shows a farm supply tapping off a rural overhead line erected by us for the progressive Wolverhampton Corporation Electricity Supply. The J. & P. Pole Type Transformer and Switchgear, specially designed for such services, will be clearly seen.



Johnson & Phillips, Ltd., Charlton, London, S.E.7

Branches in London (City), Birmingham, Bristol, Manchester, Cardiff, Glasgow, Ipswich, Derby, Newcastle, Liverpool, Portsmouth and Belfast.

The mark that means that "little more" in quality

one of the J.&P. pages

New Light for The Town Hall

In the larger cities, towns and suburbs, the Town Hall is often a somewhat aloof and forbidding building, connected, in the mind of the ordinary citizen, rather with the payment of rates than with any pleasant association. In the small town, however, the case is different. The Town Hall is often the centre of the social life of the place; the place where dances, concerts, theatrical shows and other frivolities take place. When public meetings are held there, everybody goes. So anything that brightens the Town Hall is welcome to, and noticed by, all the citizens.

Our photograph shows the Town Hall at Carluke, which has recently been wired for electricity by Mr. James Marshall, 11, Clyde Street, Carluke. J. & P. Cable was used throughout. The small view shows Mr. Marshall's premises, also wired with J. & P. Cable.

ELECTRICAL ENGINEERS & CABLE MAKERS

Johnson & Phillips, Ltd., Charlton, London, S.E.7

Branches in Sydney, Melbourne, Johannesburg, Durban, Wellington, Bombay, Calcutta and Singapore.

The mark that means that "little more" in quality

AT CROYDON AERODROME— MARCONI WIRELESS APPARATUS

Wireless communication is an essential factor in the daily routine of commercial flying, and the wireless organisation at the new London Terminal Aerodrome, Croydon, has accordingly received the fullest consideration. Four 3-kilowatt transmitters working on different wavelengths, and direction-finding receivers embodying the newest improvements of wireless control, have been installed for communication with aircraft in flight and with other aerodromes.

Croydon Aerodrome: Wireless Transmitting Station.

The control of the transmitters, receivers and direction-finding apparatus is centred in two wireless rooms in the aerodrome buildings, but the actual transmitting station has been erected at a distance of 2½ miles from the aerodrome in order to eliminate possible interference with aircraft from the high masts and aerials.

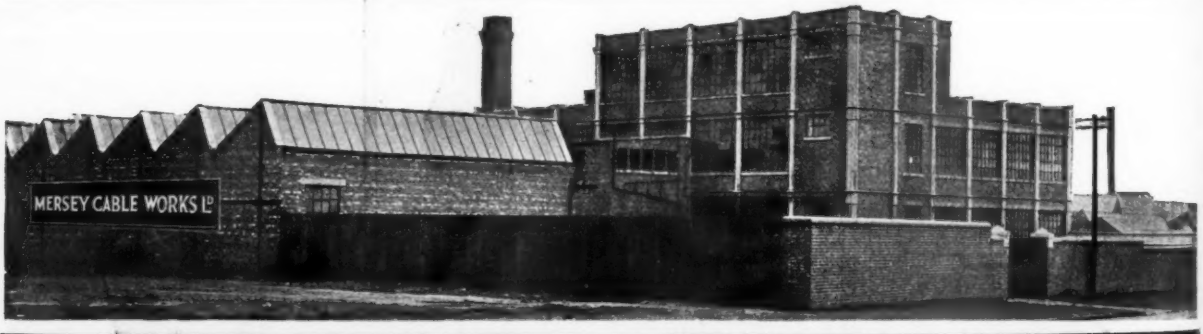
The wireless equipment of the new aerodrome has been supplied to the Air Ministry by Marconi's Wireless Telegraph Co., Ltd.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.,

MARCONI HOUSE, STRAND, LONDON, W.C. 2.

Telephone: City 8710. *Telegrams: Inland—Expanse, Estrand, London.* *Foreign—Expanse, London.*

BE 228



C.T.S. CABLES

MERSEY CABLES

Toughness and Flexibility are features of Mersey C.T.S. Cables. They can be thoroughly relied upon to give staunch service under all conditions.

Specify Mersey Cables, and make a good "job" of it.

Mersey Cable Works

LIMITED,

BOOTLE LIVERPOOL

Telephone: Bootle 1485. *Telegrams:* "Mercables, Liverpool."
Codes: Western Union, Hamilton (5 Letter).

SPECIFY "EFESCA"

REGD. TRADE MARK EFESCA

The purchasing of reliable Electrical Accessories is of vital importance to the Contractor. For this reason you should place your orders for

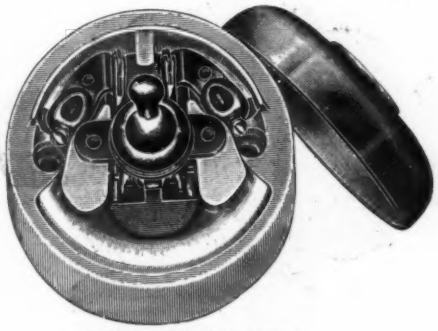
"EFESCA" ELECTRIC LIGHTING SUPPLIES

BRITISH MADE.

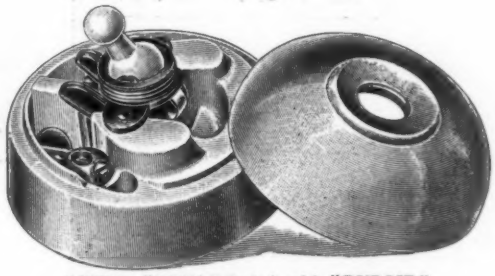
"NOVA" H.V. FLAT TUMBLER SWITCH

(Patent)

A first-class Switch at an attractive price!



S.82531. "NOVA" Switch.



S.82532. "NOVA" Switch with "DUROID" unbreakable shockproof cover and Dolly to match.

A Switch of unique construction possessing novel features and fewer working parts. The effective action and strength of working parts has been fully maintained. The wiring terminals are shaped from one piece of metal, therefore no loose contacts to heat up. Contact arms are of phosphor bronze, positive stone link action.

We can fill your requirements for any type or finish of switch FROM STOCK.

SAMPLES GLADLY SENT ON APPLICATION.

Write for Leaflet P1160 giving full particulars and prices.

LAMP SERVICE
WE CARRY EXTENSIVE STOCKS OF ASSOCIATION LAMPS.
Also all makes of Radio Valve
DELIVERY BY RETURN

Further particulars of all EFESCA ACCESSORIES on application from:

Falk, Stadelmann, & Co. Ltd.

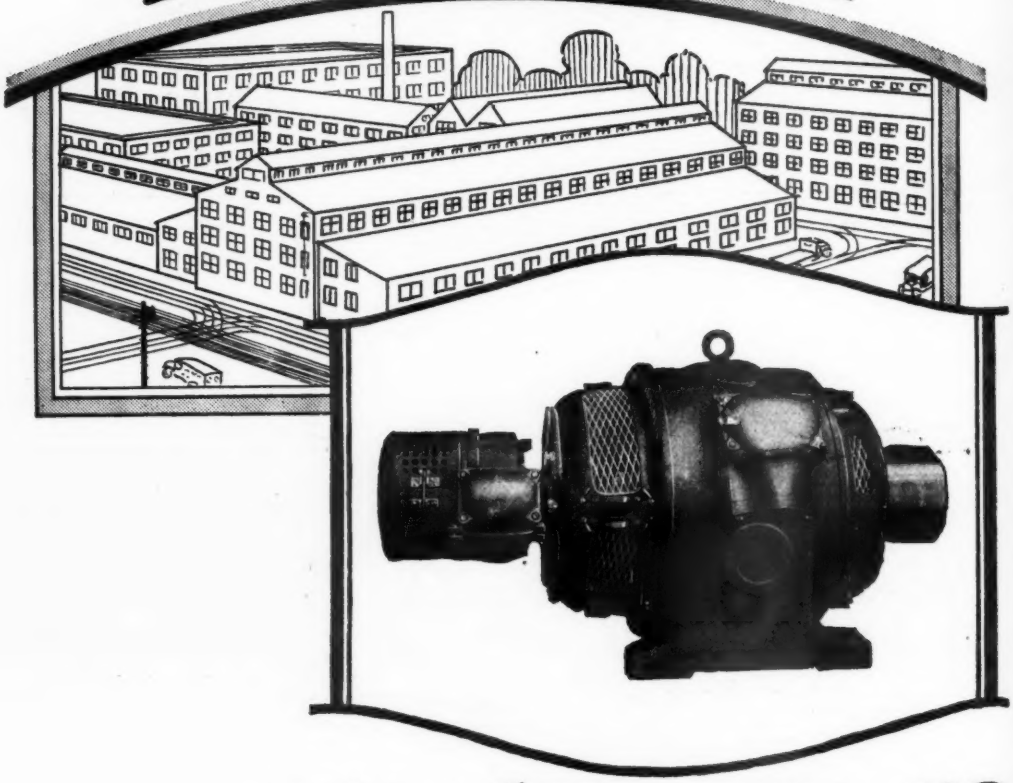
EFESCA ELECTRICAL WORKS

83-93, FARRINGDON ROAD, LONDON, E.C. 1.

Veritas House, Great Clyde Street, GLASGOW, C.1.
Veritas House, Rochdale Road, MANCHESTER.
Veritas House, Lionel Street, BIRMINGHAM.
Efesca House, 29, Exchequer Street, DUBLIN.
Veritas House, Hanover Square, NEWCASTLE/TYNE.
Veritas House, 85/6, Frederick Street, CARDIFF.

Works: BIRMINGHAM.

CROMPTON PARKINSON TRU-WAT MOTOR



Why "Tru-Wat"?

Because "Tru-Wat" is entirely different from all other single unit motors. For Power Factor correction purposes it is different with an advantage. The "Tru-Wat" motor is capable of '4 leading which is greater than any compensated alternating current motor advertised for any similar purpose.

Equally important is the fact that it commutates continuous current at low voltage. Its starting function is as simple as any ordinary motor and in operation it is sparkless and capable of all the duties of an induction motor.

By its use power bills and installation costs can be substantially reduced.

Crompton Parkinson specialists will supply all details without any obligation on your part.

CROMPTON PARKINSON PRODUCTS

A.C. & C.C. Motors
Generating Plant
Auto Synchronous Motors
Tru-Wat Motors
Rotary Convertors
Transformers
Switchboards
Instruments
Frequency Changers

CROMPTON

Head Office: GUISELEY, LEEDS.

Works: GUISELEY & CHELMSFORD.

SAVED 1,000 TONS OF COAL A YEAR

On a machine capable of effecting a reduction in coal consumption of some 1,000 tons a year, nothing could be left to chance, for failure to operate would prove a costly business—far more than the cost of the power unit employed—with consequent disorganisation and possibly breakdown of an essential service.

The specification by Messrs. Alfred Herbert, Ltd. of Crompton Parkinson electric motor drive for their Coal Drying, Pulverising and Firing Machines, dispelled all possibility of mechanical failure. The sturdy construction and characteristic dependability of the Crompton Parkinson Motor commended its installation as being most suited to the job.

Specify Crompton Parkinson motors for your drives. Our experience in the application of electric power is without equal in the industry.

CROMPTON PARKINSON PRODUCTS

A.C. & C.C. Motors
Generating Plant
Auto Synchronous Motors
Tru-Wat Motors
Rotary Converters
Transformers
Switchboards
Instruments
Frequency Changers

CROMPTON PARKINSON LIMITED

EVERYTHING The G.E.C. your guarantee ELECTRICAL

ELECTRIC LIGHT FITTINGS

AT THE NEW OXFORD CORNER HOUSE.

Mr. Oliver P. Bernard has conceived some unique and impressively beautiful effects in the decorative scheme of the New Oxford Corner House.

The lighting is superb and affords a striking illustration of the harmonious effects obtained when the lighting units are designed as an integral part of the scheme.

All the decorative lighting units for the public rooms and staircases were manufactured and supplied by the G E.C. to the designs of and in collaboration with Mr. Oliver P. Bernard.

THE GENERAL ELECTRIC CO., LTD.,

Head Office : **Magnet House, Kingsway, London, W.C.2.**

Branches throughout Great Britain and in all the principal markets of the world.

DISPLAYED ADVERTISEMENTS

ADVERTISERS will please note that NEW COPY and ALTERATIONS to existing Advertisements (with Blocks) should reach here not later than

THURSDAY MORNING

OF THE WEEK PREVIOUS TO ISSUE.

OFFICIAL NOTICES, PATENT NOTICES, SITUATIONS VACANT, SITUATIONS WANTED, PARTNERSHIPS, AGENCIES, ARTICLES FOR SALE, ARTICLES WANTED, ETC.

Latest Time 5 p.m. TUESDAY.

The ELECTRICAL REVIEW is the recognised Medium of the Electrical Trades, and has BY FAR THE LARGEST CIRCULATION of any Electrical Industrial Paper in Great Britain.

THE "ELECTRICAL REVIEW'S" SUGGESTIONS for dealing with

Apparent Death from Electric Shock

should be in every Generating, Transforming and Motor House.

Mounted on Cardboard, 1/6 each. Post free, 2s.

The ELECTRICAL REVIEW, Ltd., 4, Ludgate Hill, London, E.C.4.

VALUATIONS and AUCTIONS

of

Electrical Works, Plant & Stock.

WHEATLEY KIRK, PRICE & CO.

PARTNERSHIPS NEGOTIATED.

(Established 1850.)

46, Watling Street, London, E.C.4. — **16, Albert Square, Manchester.**

26, Collingwood Street, Newcastle-on-Tyne.

By Order of the Liquidator.

Re SUTTON & BRIDGMAN, LTD., in Voluntary Liquidation, and other Estates.

13, HIGH HOLBORN, W.C.1.

HENRY J. SHAW

Is instructed to Sell by Auction without reserve on WEDNESDAY, JULY 4th, at 11.30 prompt, important Trade Stocks of

ELECTRICAL AND WIRELESS GOODS AND MATERIAL,

Conduit Fittings, Screwed, Pin Grip, &c., Solid Drawn Steel Tubing, Lighting Sets, Parts and Spares, Lampholders, Cutouts, &c., 2,000 coils V.I.R. Cable, Lead Covered ditto, Bell Wire, Telephone and High Tension Cable, 100,000 Ebonestos Nuts, Hot-water Geysers, New Revo and G.E.C. Ironclad and Teak Switch and Fuseboards, New Revo 100-amp. Fluvent Ironclad Switch and Fuse, Hotpoint Handy Vac. and Liberty Vacuum Cleaners, 20 miles 1/.044 V.I.R. Cable, Platform Counter Scales, &c.

On view day previous and morning of Sale.

Catalogues upon application to the Liquidator, H. A. Snell, Esq., 7, Unity Street, Bristol; or the Auctioneer, 129, Newington Causeway, London, S.E.1. 'Phone: Hop 3862.

2678

By Order of the Receiver — Stewart Cole, Esq., F.C.A.

DUNBAR'S COOPERAGE, LIMITED, GLENGALL ROAD, MILLWALL, E.14.

23 ELECTRIC MOTORS by Bruce Peebles, B.T.H., and others, 2 h.p. to 40 h.p., d.c.,

will be included in the above sale by

LEOPOLD FARMER & SONS,

in conjunction with

TYLER & CO.,

On the Premises on TUESDAY, JULY 3rd, 1928, and following day, at 11 o'clock each day.

Particulars of Stewart Cole, Esq., F.C.A., of Messrs. Cole, Dickin & Hills, "Sardinia House," Sardinia Street, Kingsway, W.C.2, Messrs. Davis & Davis, Solicitors, Mansion House Chambers, 11, Queen Victoria Street, E.C.4, Messrs. Tyler and Co., Surveyors and Valuers, 45, Holborn Viaduct, E.C.1, and the Auctioneers, 46, Gresham Street, E.C.2, and Kilburn, N.W.6.

2617

SITUATIONS VACANT.

Latest time for receiving, 5 p.m. Tuesday.

If letters are not to be delivered to certain firms or individuals (if known), instructions to that effect should be sent to the Manager of the ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants cannot in such cases be returned to them, nor can the names of Advertisers using a number in any way be disclosed.

Original Testimonials should never be sent.

BOROUGH OF RICHMOND (SURREY).

Appointment of Fireman-Electrician.

THE Fire Brigade Committee invite applications for the appointment of Fireman-Electrician in the Richmond (Surrey) Fire Brigade.

Wages £3 10s. 0d. per week, rising by annual increments of 2s. 6d. per week to a maximum of £4 10s. 0d. per week, with free quarters if the person appointed is a single man, or, if a married man is appointed, an allowance of 10s. per week in lieu of quarters will be made, until such time as quarters are provided.

Preference will be given to single men.

Applicants, whose age should not exceed 35 years, must be experienced electricians and capable of maintaining the Fire Brigade electrical apparatus, including the Stuart & Moore Fire Alarm System.

The appointment will be subject to a satisfactory medical examination, and, after six months' probationary service, to the provisions of the Fire Brigade Pensions Act, 1925.

Applications, endorsed "Fireman Electrician," stating age, whether married or single, qualifications and experience, accompanied by not more than three recent testimonials, must be received by the Borough Engineer and Surveyor, Town Hall, Richmond, Surrey, not later than July 7th, 1928.

HENRY SAGAR,
Town Clerk.

Town Hall,
Richmond, Surrey,
20th June, 1928.

2682

COUNTY OF LONDON.

THE London County Council invites applications for the position of Charge Shift Engineer in the Tramways Department at the Greenwich Power Station.

Candidates must have had a suitable engineering training and have had experience in the running of large modern power stations.

The age of candidates must not exceed 40 years on the latest date for the receipt of applications.

The salary will be £250 a year, rising by annual increments of £10 to a maximum of £300 a year. The salaries mentioned are subject to temporary additions on the Civil Service Scale, making the total commencing remuneration on the existing basis, £361 2s. 6d. a year.

Applications must be on forms (containing full details) to be obtained from the Clerk of the Council, The County Hall, Westminster Bridge, S.E.1 (stamped addressed foolscap envelope necessary). Forms must be returned so as to be received not later than Tuesday, July 10th, 1928. Canvassing disqualifies.

MONTAGU H. COX,
Clerk of the London County Council.

2745

ASSISTANT WANTED.

ASSISTANT in Meter Department required at once. Commencing salary £150 per annum.

Applicant with experience in the testing and fixing of a.c. meters, please write, giving full particulars of education, training and experience, to: West Gloucestershire Power Co., Ltd., 21, Eastgate Street, Gloucester, marking envelope "Meter Dept."

2739

SITUATIONS VACANT.—*Continued.*

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL.

Electricity Department.

APPLICATIONS are invited for the position as PLUMBER JOINTER.

Applicants must be experienced in jointing 6,600-volt mains. Applications, stating age, experience, wages, and earliest date when duties can be commenced, together with copies of references, to be forwarded to the Engineer and Manager, 37, High Street, Cheadle, Cheshire, not later than Friday, July 6th, 1928.

Council Offices, Cheadle, Cheshire, June 22nd, 1928.

W. TIMPERLEY, Clerk. 2675

REPRESENTATIVES WANTED.

TO SELL ELECTRIC SOLDERING IRONS AS A SIDE LINE TO ACTUAL USERS.

GOOD commission, part expenses, exclusive territory. The goods are of excellent quality, and we can already claim some of the largest firms in the country as our customers. An extensive advertising campaign will shortly be commenced which should considerably help business. Replies, giving full particulars of present lines handled and territory covered are requested from real live men only.—2473, Electrical Review, 4, Ludgate Hill, London.

SUPERVISING ELECTRICAL ENGINEER.

WANTED, a thoroughly competent Electrical Engineer, who has had considerable experience on power distribution, the erection of electrical plant, chain drives, &c., &c. Excellent references essential.—Apply, stating salary required, Gent, Hurley & Orringe, Electrical Engineers, Belvoir Street, Leicester. 2695

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

A GOOD Fitter and Turner required with practical experience in the maintenance of Lancashire boilers, pumps, engines, &c. Must have served a regular apprenticeship and be accustomed to the work of a large Institution. It is useless to apply without these qualifications. Age not to exceed 35 years. Wages 67s. 6d. per week, subject to deductions under the Asylum Officers Superannuation Act, 1909. A cottage will be available for a married man at the low rent of 7s. 9d. per week.—Apply by letter, stating experience, with copies of two recent testimonials, to the Steward, Netherne Mental Hospital, Coulsdon, Surrey. 2731

ARMATURE Winder wanted for London repair works; must be used to a.c. and d.c. rewinds and repairs, also outside work; regular job for first-class man. State age, experience, and wages required.—2732, Electrical Review, 4, Ludgate Hill, London.

ASSISTANT for Development, Research, and Investigation. Thorough Technical Education essential, with good knowledge of Electrical Design.—State age, qualifications and salary required, to Newton Brothers (Derby), Ltd., Derby. 2686

ASSISTANT Manager.—Cable manufacturers require an Assistant Manager for their estimating department. Must be fully experienced and capable of controlling staff. State full particulars and salary required. Replies treated in strict confidence.—2704, Electrical Review, 4, Ludgate Hill, London.

ASSISTANT required for Sales Department; age 20-25. Previous experience necessary.—Write, stating salary required, to Dept. DSM., The London Electric Wire Co. and Smiths, Ltd., Church Road, Leyton, E.10. 2693

ASSISTANT Testers wanted for a.c. meter testing.—Apply personally or by letter, giving age, experience, &c., to Aron Electricity Meter, Ltd., 80, Salusbury Road, Kilburn, N.W.6. 2700

CABLE Manufacturers require Capable Assistant for estimating department. Must be experienced. State full particulars and salary required. Replies treated in confidence.—2703, Electrical Review, 4, Ludgate Hill, London.

DESIGNER.—Junior Assistant required in Design Office of leading firm in Birmingham district. Applicant must have technical college training and experience in the design of small motors.—Apply, giving full particulars of Technical Education, experience and salary required, to 2630, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN required for development and design of switchgear and small apparatus. Must be quick and have a good technical education. Age about 24 years.—Apply, stating age, experience, and salary required, to Park Royal Engineering Co., Ltd., Cumberland Avenue, Park Royal, N.W.10. 2698

SITUATIONS VACANT.—*Continued.*

DRAUGHTSMAN required, age about 24 years, for cable sealing boxes, link boxes, feeder pillars, and ironclad knife switches, &c.—Apply, stating age, experience, and salary required, to Johnson & Phillips, Ltd., Charlton, S.E.7. 2697

DRAUGHTSMAN wanted, capable of mechanical design and layout of a.c. and d.c. machines—chiefly rotary convertors—capacity up to 1,500 kW.—State age, experience, and salary required to 2711, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN, experienced, for boxes, pillars, and cable accessories generally. State particulars of designing and practical experience, also age, salary required, &c.—Apply, British Insulated Cables, Ltd., Prescot. 2723

DRAUGHTSMAN (Senior) required by large engineering firm. Applicants must have sound mechanical engineering knowledge and preferably, but not imperatively, electrical experience on motors and generators.—Apply, with full particulars of age, experience, and salary required, to 2684, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN wanted (London district), experienced in electrical work (precise variety not important); must be quick and adaptable. Really capable junior would be considered.—State age, experience and salary required to 6707, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN for a.c. and d.c. machines. Familiarity with Admiralty requirements an advantage. London district. State experience and salary required.—2736, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMEN, having experience of electric control gear or power transformer work.—Apply, stating age, experience, and salary required, to 2677, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Distributing Engineer required for the East. No candidate need apply who has not had a sound theoretical and practical training, with extensive knowledge of electrical distribution work in all its branches, including ring mains, sub-stations and switchgear, and of transmission with practical experience up to 33,000 volts. Single man preferred. Age 26-32.—Apply, with full details of education, training, and subsequent career, to "Distribution," 6782, Electrical Review, 4, Ludgate Hill, London.

ELECTRICIAN in Charge for small country works. Experienced in crude oil engines and three-phase plant essential. State experience and terms.—2674, Electrical Review, 4, Ludgate Hill, London.

ELECTRICIAN required by firm of Electrical Contractors (London). Applicant must be a competent and quick worker, able to carry out large or small jobs with the assistance of a mate only. Must be capable of working from architect's plans. Preference given to applicant with technical knowledge.—Write, giving full particulars of past experience, stating age, whether engaged or disengaged, and when at liberty to start, to 2735, Electrical Review, 4, Ludgate Hill, London. Permanency to suitable applicant.

ESTIMATING Engineer required as Assistant in London office of large electrical plant manufacturing company. Preference given to man experienced in preparation of estimates and in handling all price lists on motors, transformers, switchgear, &c.—State age, salary, experience, references, to 2694, Electrical Review, 4, Ludgate Hill, London.

EXPERIENCED Transformer Draughtsmen wanted.—Apply, stating age, experience, and salary required, to 2634, Electrical Review, 4, Ludgate Hill, London.

FIRST-Class Senior Draughtsman and Designer required by progressive firm of electrical manufacturers. One with all-round practical and commercial experience of mechanical details and intimate knowledge of electrical design of a.c. motors, all sizes and types, required.—State age, experience, salary required, and when at liberty, enclosing copies of recent testimonials, to 2741, Electrical Review, 4, Ludgate Hill, London.

INTELLIGENT Youth required for electrical and wireless; retail shop experience necessary for counter trade. Good reference required.—State wages to 6803, Electrical Review, 4, Ludgate Hill, London.

JUNIOR Shift or Improver for small station. Steam and Diesel plant—knowledge of a.c. working desirable. Wages £3 10s. 0d. per week (48 hours).—Applications, with references, by 2nd July, 1928, to the Electrical Engineer, U.D.C. Electricity Works, Stanley Street, Horsham. 2639

LADY Shorthand-Typist wanted with experience in the Estimating Office of electrical plant manufacturers.—Write, stating full particulars and salary required, to 6791, Electrical Review, 4, Ludgate Hill, London.

METROPOLITAN-Vickers Electrical Company, Limited, Trafford Park, Manchester, requires experienced Draughtsmen for transformer design and construction.—Apply, by letter addressed to the Company's Employment Department, with particulars of age, experience, and salary required. Envelopes should be marked "Transformer Draughtsmen." 2526

SITUATIONS VACANT.—*Continued.*

METER Superintendent required to take full charge of maintenance and repair of instruments and meters, principally trivector maximum demand type, for large distribution network in Malaya. Salary £500-£600, according to experience, with free quarters and medical attendance. Applicants, who must be single and aged about 35, must have had thorough training and works experience, and be able to carry out work personally and train assistants.—Apply, by letter only, to The Perak River Hydro-Electric Power Company, Limited, 3, Central Buildings, Westminster, S.W.1, giving full particulars of training, qualifications and past practical experience, and enclosing copy references. 2671

MICA Expert required by Export Company in British India. Young man with good knowledge of the trade preferred. Must be experienced in mica grading, estimating, &c., for purchasing. Best prospects for a suitable and reliable man.—Apply with details of past record and references, to 2602, Electrical Review, 4, Ludgate Hill, London.

REPRESENTATIVE (Travelling), with technical and commercial experience, required to call on consulting engineers, architects, business houses, &c., in Outer London for the representation of electrical equipment and repairs, &c.—Apply, with full particulars, age, and remuneration expected, to 6801, Electrical Review, 4, Ludgate Hill, London.

REPRESENTATIVE wanted by old-established West End contractors. Must be of good address, connection amongst architects preferred.—Apply, stating qualifications, &c., to 2530, Electrical Review, 4, Ludgate Hill, London.

REPRESENTATIVE (Travelling) for London required, having experience (technical and commercial) in calling on consulting engineers, architects, business houses, &c., for the representation of well-known specialities.—Apply with full particulars, age and remuneration expected, to 2608, Electrical Review, 4, Ludgate Hill, London.

REPRESENTATIVES, with sound connection amongst electrical contractors, retailers, &c., required for several territories which we still have vacant in London and Great Britain for the sale of anything and everything electrical. Apply with the fullest particulars that will enable us to judge your application with as little delay as possible and fix an appointment.—John Shaw & Sons, Wolverhampton, Limited, Wolverhampton. 2618

REQUIRED, single Improver Electrician Assistant for private generating station. Single quarters found.—Apply, stating experience in running a.c. and d.c. motors and generators and battery charging, and wages required, to 2683, Electrical Review, 4, Ludgate Hill, London.

REQUIRED to take charge of motor lamp department of a well-known E.L.M.A. manufacturer, a capable Organiser and Salesman.—Give full particulars (which will be treated in confidence) of experience, age, salary required, to 2709, Electrical Review, 4, Ludgate Hill, London.

RESIDENT Engineer and Sales Manager required for Scottish branch in Edinburgh. Knowledge of the lift trade and of organised sales effort is essential.—Etchells, Congdon and Muir, Ltd., Lift Manufacturers, 25, Mill Street, Ancoats, Manchester. 6841

SALESMAN required by manufacturers of well-known first-class dry batteries and accumulators. Extensive trade connection essential. High salary paid to man of proved ability. No others need apply. State previous employers, turnover effected in batteries and accumulators, salary expected and give copies testimonials.—Apply, in confidence, to 2710, Electrical Review, 4, Ludgate Hill, London.

SALES Engineer, must have good London connection motors, repairs, installations. Genuine opening right man willing commence small salary and liberal commission. Every technical and works assistance. State experience and salary required.—2740, Electrical Review, 4, Ludgate Hill, London.

SALES Engineer (Assistant) wanted, about 22 or 23. Electric motor test bed experience desirable. Personal application preferred. Excellent prospects.—Higgs Motors, Witton, Birmingham. 2655

SHORTHAND-Typist for electrical contractors' office, E.C.2, familiar with trade terms. State speeds, age, salary required.—2729, Electrical Review, 4, Ludgate Hill, London.

SUPERVISING Engineer wanted. Experienced in e.h.t. and l.t. overhead construction and in cable laying.—Apply, giving experience, how soon available, and stating salary, to 2733, Electrical Review, 4, Ludgate Hill, London.

SWITCHGEAR Draughtsman required, accustomed to l.t. flat back switchboards and small lighting and power accessories. Midlands.—State age, salary and experience to 6798, Electrical Review, 4, Ludgate Hill, London.

TECHNICAL Assistant wanted for Wireless Laboratory. Must have first-class experience.—Box 171, c/o Knights, 55, Chancery Lane, W.C.2. 6792

TESTER of small motors, ceiling and desk fans, both d.c. and a.c., for works in the Midlands. Apply, stating experience, salary required, and when free.—2706, Electrical Review, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

TEST Room Assistant required for relay and general apparatus tests. Experience with railway signal apparatus preferred. London district.—State wages and experience to 2687, Electrical Review, 4, Ludgate Hill, London.

TRANSFORMER Designer (Junior) required in London area.—State age, experience, salary required, to 2707, Electrical Review, 4, Ludgate Hill, London.

WANTED, a Man of general electrical experience, suitable for maintenance and distribution work, 3-wire d.c. system and 4-wire a.c., h.t. and l.t. consumers' requirements, services and meter work.—Apply, giving references, full particulars of experience, married or single, and wages required, not later than 7th July, 1928, to Engineer and Manager, Leatherhead & District Electricity Co., Ltd., Leatherhead. 2696

WANTED, exceptionally good Works Manager for electricity meter manufacturing company. Must be thoroughly experienced in the manufacture and assembly of meter parts and have good technical knowledge. Experience of modern methods of works management essential. Apply, stating age and with full particulars of experience and copies of testimonials. Liberal salary to first-class man.—2699, Electrical Review, 4, Ludgate Hill, London.

WANTED, Boilerhouse Superintendent, with up-to-date experience in the most modern methods of steam raising. Must have a good knowledge of the latest scientific practice with regard to the means for, and obtainment of, the maximum thermal efficiencies. Only first-class man will be considered.—Please write, stating experience, age, and salary required, to ref. B.H., 2669, Electrical Review, 4, Ludgate Hill, London.

YOUTH required to assist in stores; some experience of electric fittings essential.—Apply, stating age, experience, and salary expected, to 2688, Electrical Review, 4, Ludgate Hill, London.

APPOINTMENTS FILLED.

Dissatisfaction having been so often expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision. We will then insert a notice free of charge under this heading.

BOX 2425 (Chief Draughtsman), Box 6576 (Storekeeper); Box 1632 (Assistant Electrical Engineer); Box 2276 (Two Engineer Salesmen); Box 2277 (Assistant Sales Manager); Box 6663 (Overhead Linesmen); Box 2529 (Sports Organiser); Box 2586 (Working Foreman).

SITUATIONS WANTED.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

A CAPABLE all-round Meter Engineer desires situation as Meter Superintendent or Overseer. Good organiser; 12 years' practical experience. Highest references.—6778, Electrical Review, 4, Ludgate Hill, London.

A CAPABLE Electrical Engineer (25), 3 years pupil L.B.S.C. Railway Electricity Department; 4 years' subsequent experience handling large contracts and laying mains, seeks position urgently. Subaltern R. Signals, Territorial Army.—6777, Electrical Review, 4, Ludgate Hill, London.

A CAPABLE Manager, with 35 years' experience, commercial, technical, practical, eminent London contractors, seeks responsible appointment. Highest references.—6790, Electrical Review, 4, Ludgate Hill, London.

A CAPABLE Electrician (30), indentured apprentice, seeks permanent post; experience, country house lighting plants, engine overhauls, batteries, motors, lighting, &c. Good all-round, practical and theoretical, a.c., d.c.; 15 years present firm.—6836, Electrical Review, 4, Ludgate Hill, London.

A CAPABLE Engineer (31) with 8 years' experience e.h.t. and l.t. power lines, overhead equipment for electric railways, tramways and trackless. Just returned on completion of contract abroad.—6801, Electrical Review, 4, Ludgate Hill, London.

A CAPABLE Electrician seeks employment; twelve years' sound practical and theoretical experience of lighting, power, storage batteries, printing equipment, combustion engines, general fitting, &c.—Thomas, 28, Overhill Road, Dulwich. 6659

A CAPABLE disengaged Electrical Engineer (28, married) seeks post; 12 years construction, wiring, and maintenance; excellent references.—Lonsdale, 45, Arlington Road, N.W.1. 6724

A COMPETENT Wireman seeks engagement; any system.—L. B., 58, Dunsdale Road, Fulham, S.W.6. 6839

SITUATIONS WANTED.—*Continued.*

A CLERK (24), single, seeks better prospective and remunerative appointment with municipal undertaking or supply company at home or abroad; two years in present capacity of mains and consumers' clerk with Municipal Council in London, seven years with well-known electrical manufacturing company in London. Experienced bookkeeping, accounts, sales routine, records costing, orders, maintenance, stores, labour, correspondence and general routine.—Reply with particulars, stating approximate salary, to 6682, Electrical Review, 4, Ludgate Hill, London.

A ELECTRICAL Engineer with brilliant sales record; thorough works and technical training; unique experience heavy plant and motor markets. Desires change. Position of responsibility. Payment by results.—6793, Electrical Review, 4, Ludgate Hill, London.

A YOUNG Man (29), nine years rewinds, repairs, &c., a.c., d.c., seeks opportunity in any electrical undertaking, in or near London. Willing to be trained. Total abstainer.—6742, Electrical Review, 4, Ludgate Hill, London.

ADVERTISER, age 40, associated with engineering industry 22 years, and has achieved success in Eastern countries in sales managerial capacities for large British firms, and now wishes opening at home if possible, but would also welcome inquiries from firms interested in India, Malay, China, South Africa or Australia. Ten years' experience in India and four years in China.—6783, Electrical Review, 4, Ludgate Hill, London.

ADVERTISER requires responsible position. Experience includes premium apprenticeship, designing and 4 years' technical staff London telegraph instrument firm. Used to precision testing. Public school and technical education.—6810, Electrical Review, 4, Ludgate Hill, London.

ADVERTISER requires position as Foreman Electrician or Assistant Engineer; five years' experience on electrical traction; thoroughly capable of taking charge of the erection and wiring of electrical equipment.—Apply, 2, Fielding Terrace, Ealing Common. 6785

ADVERTISER, Foreman, working or otherwise, seeks similar position; experience large installations, lighting, power, a.c., d.c., estimating, control.—C., 46, Delorme Street, Hammersmith. 6755

ADVERTISER with many years' experience in Accountancy and Secretarial duties, seeks employment. Excellent references.—Gardner, 24, Killowen Road, South Hackney, E.9. 6359

A.M.I.E.E. desires change: Designer, Chief Draughtsman, Control Engineer, or other responsible position; 24 years' experience in the design of switch and control gear, including many years' experience in the design and application of contactor control gear to industrial and marine requirements. Competent and reliable.—6814, Electrical Review, 4, Ludgate Hill, London.

A.M.I.E.E., 38, technical diploma, practical and commercial experience; 17 years with leading electrical firm; desires responsible position.—6773, Electrical Review, 4, Ludgate Hill, London.

AN Electrician (age 26), fully experienced all branches installation work, seeks permanency, either as Electrician or Showroom Assistant, &c. Town or country.—6746, Electrical Review, 4, Ludgate Hill, London.

APPOINTMENT desired by Engineer, electrical and mechanical (34); fully qualified in operation, maintenance, and repair, modern steam and electrical plant, as applied to mining, central station, and works; home or abroad.—6835, Electrical Review, 4, Ludgate Hill, London.

ARMATURE Winder, 15 years' experience a.c. and d.c. Good all-round electrician. Charge, bench or maintenance. London district.—Electric, 30, Grosvenor Road, Chiswick. 6700

BAKELITE Moulding Manager desires change; conversant with up-to-date methods, both moulding and tool design. Good organiser. Designing draughtsman by calling.—6729, Electrical Review, 4, Ludgate Hill, London.

CABLE Jointer requires situation. Used to installing complete services, including meter fixing.—6813, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN (24) desires change to a progressive position. Any department, mechanical or electrical. Sound technical man.—6719, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Draughtsman seeks contract work from consultants, engineers, &c., for preliminary and final layouts of sub-stations and all classes of switchgear.—Write 6680, Electrical Review, 4, Ludgate Hill, London, or 'phone: Maida Vale 3925.

ELECTRICIAN seeks job, erection, maintenance and repair; all-round experience.—W.D., 138, Sydney Road, N.10. 6747

SITUATIONS WANTED.—*Continued.*

ELECTRICAL Engineer (26) requires appointment; four years' administrative works experience, electrical heating and accessory; college electrical education; conversant design, manufacture of all domestic appliances, control of men, office routine.—6840, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Engineer, diploma, requires responsible position; 18 years' practical experience.—T.A., 655, Green Lanes, N.8. 6669

ELECTRICIAN seeks situation, factory maintenance or wireman; age 26; good references; go anywhere.—G. C. Townes, 48, Balaam Street, Plaistow, London. 6821

ELECTRICIAN, age 32, 16 years' experience; power, lighting, &c.—Croser, 4, Cobham Road, N.22. 6718

ELECTRICIAN and Salesman seeks situation in either capacity; estimating, interviewing, and general management; excellent references.—6816, Electrical Review, 4, Ludgate Hill, London.

ELECTRICIAN-Wireman (28), reliable, 13 years' varied experience. Anywhere.—Green, 13, Ravensdon Street, S.E.11. 6744

ELECTRICIAN-Wireman, competent, reliable, all systems, maintenance, repairs.—J., 156, Nelson Road, Hornsey, N.8. 6741

ELECTRICIAN, all-round; wiring, maintenance, or plant.—C., 5, Windsor Road, N.7. 6820

ELECTRICIAN, plant or wiring, any job, any distance.—71, Kenthouse Road, Sydenham. 6817

ELECTRICIAN, experienced, lighting, power, wiring, maintenance, &c.—Vince, 2, Anerley Station Road, S.E.20. 6812

ELECTRICIAN, competent; light, power, installations. Full or part time.—"Electric," 325, Kilburn Lane, N.W.6. 6837

ELECTRICIAN, disengaged; experienced; lighting and power, &c.—G.H., 150, Windmill Road, Brentford. 6838

ELECTRICIAN wants berth, supply company's experience, heavy conduits, lighting, heating, power, plumber, jointing, high and low tension cables, estimating, &c. Would suit small supply company. Any distance.—Williams, 30, Highweek Road, Tottenham, London, N.15. 6808

ELECTRICIAN, charge or otherwise, age 37, first-class experience in installation of lighting and power, d.c. and a.c., bells, telephones, &c., in all systems; good technical and practical training; well up in testing and fault locating.—J. Burry, 25, East Avenue, Walthamstow, E.17. 6749

ELECTRICIAN seeks appointment (31); 14 years' practical and technical experience in power, lighting, telephones, &c.—E. Belcher, 15, Acton Street, King's Cross, London, W.C.1. 6784

ELECTRICIAN-Wireman seeks situation, all systems.—17, Alexandra Road, Botley Road, Oxford. 6788

ELECTRICIAN-Wireman, all systems; age 34.—A. Daniels, Stanley Cottage, Pineapple Road, Amersham Common, Bucks. 6794

ELECTRICIAN, long experience, plant, 'phones, &c. References.—Allan, 23, Britten Street, Chelsea. 6699

ELECTRICIAN, all systems; motors, bells, 'phones; excellent references; anywhere.—Weston, 133, Lupus Street, W.1. 6670

ELECTRICIAN (36), all-round experience; charge hand preferred.—6650, Electrical Review, 4, Ludgate Hill, London.

ELECTRICIAN Improver (23), 6 years' experience; all systems; light, power, 'phones, bells; good reference.—F.S., 34, Stavordale Road, N.5. 6657

ENGINEERING Assistant (24) requires progressive position; mechanical pupilage and technical training; 4 years with electrical undertaking; experienced in draughtsmanship, plant installation, construction work, and general.—6656, Electrical Review, 4, Ludgate Hill, London.

ENGINEERS' Millwright Electrician, 20 years' practical experience; first-class refs.—Write Powell, 70, Standen Road, S.W.18. 6740

ENGINEER (24); experience: steam and oil engines, turbines, dynamos, boilers, workshops, d.o., electrical testing, wiring, automatic, high frequency, telephony; thorough technical training.—6677, Electrical Review, 4, Ludgate Hill, London.

ESTIMATING Engineer, 16 years' experience in handling all classes of inquiry, including complete electrification schemes, dealing with all details, interviewing, correspondence, will consider any position offering scope for his abilities. Resident Manchester.—6708, Electrical Review, 4, Ludgate Hill, London.

SITUATIONS WANTED.—*Continued.*

FIRST-Class Wireman's Improver, 6½ years' experience all systems and repairs. Good wireman. Excellent refs. 1s. 4½d. hr.—A. T. Jones, 18, Arklow Road, New Cross, S.E.14. 6733

FOREMAN Electrician requires position, 25 years' experience; supervising, estimating. Good references.—Botting, 12, Temple Road, Cricklewood, London. 5799

LADY (24), 8 years electrical contractor's office and showrooms, desires position; correspondence, costing, typing, general office routine. Salary 50s.—6702, Electrical Review, 4, Ludgate Hill, London.

LATE Partner, 10 years manufacturing instruments, switchgear, machine-cut parts, seeks progressive position in manufacturing auto control gear, switchgear, electrical or scientific instruments. Manchester district preferred.—6706, Electrical Review, 4, Ludgate Hill, London.

PLUMBER-Jointer seeks situation; 10 years' experience on h.t. and l.t. paper and lead-covered cables; disengaged on the 5th July.—G. H. Stiling, 7, Morley Road, Leyton, E.10. 6824

PROGRESS Young Man (22) seeks progressive position; bookkeeper by examination, sales, correspondence, office routine, interviewing; six years present electrical firm.—M., 107, Merton Road, Bootle (will travel). 6653

QUALIFIED Electrical and Mechanical Fitter (30), well educated, seeks overseas post; first class experience 3-phase, e.h.t., d.c. systems, motors, transformers, switchgear, i.c. engines, testing, all classes of lighting, power house equipment, lathe work, &c. Willing to pay passage for progressive post.—6806, Electrical Review, 4, Ludgate Hill, London.

QUALIFIED Electrical and Mechanical Engineer, with several years' responsible business experience in India, desires Representative position, at home or abroad.—6484, Electrical Review, 4, Ludgate Hill, London.

RADIOLOGY, Medical and Electrical Apparatus maker, erector and Sales Engineer, desires position with prospect; 12 years' experience; testimonials.—6770, Electrical Review, 4, Ludgate Hill, London.

SALES Manager and/or Buyer. Sound organiser; 23 years best possible experience, fittings, accessories, domestic appliances, signs, wireless and electro-medical, desires change. Exceptional references, character and abilities.—6811, Electrical Review, 4, Ludgate Hill, London.

STOREKEEPER desires post; 15 years' trade experience; go anywhere; good references; moderate salary.—6815, Electrical Review, 4, Ludgate Hill, London.

SWITCHBOARD Attendant (25), a.c. power station experience; good references.—6725, Electrical Review, 4, Ludgate Hill, London.

SYNTHETIC and Bitumen Moulding Foreman or Senior Chargehand desires change; age 31; conversant with all types and methods; certified radio operator; nearly 5 years' experience.—6786, Electrical Review, 4, Ludgate Hill, London.

WIRING jobs wanted, piece or job, &c.; any system.—Wood, 344, Green Lane, Ilford. 6685

WIREMAN, disengaged; experienced all branches of the trade.—MacGregor, 255, Vicarage Farm Road, Hounslow. 6727

WIREMAN, all-round practical experience.—Caton, 31, Godfrey Street, Chelsea, S.W.3. 6752

WIREMAN, tradesman, 15 years' experience; installation and maintenance.—73, Ferndale Road, Gravesend. 6731

WIREMAN, competent reliable workman. Highest reference.—"Electrician," 19, Bryantwood Road, London, N.7. 6743

YOUTH (17½), with 2½ years' experience with firm of electrical engineers, house lighting, wireless construction, car lighting overhauls, desires similar post.—6728, Electrical Review, 4, Ludgate Hill, London.

FOR SALE.

Advertisements are inserted under this heading at 14s. per inch.

FOR SALE.

200-KW Electric Generating Set, consisting of high-speed vertical, twin-cylinder, enclosed Condensing Engine by Browett Lindley, h.p. cylinder 16 in., l.p. 22 in., 12 in. stroke, coupled direct to 200-kW, eight pole compound wound generator, 510 volts, 392 amps., at 375 revs., complete with Westinghouse Leblanc simple jet rotary condenser, direct coupled to 15 h.p., 500-volt Siemens Motor. Price £365 f.o.r. before removal.

R. B. HECKIE & CO., Electrical Engineers and Machinery Merchants,
11-13, Commerce Street, Glasgow, C.5. 2123

FOR SALE.—*Continued.*

Best British Makes. New and Equal to New at Rock Bottom Prices. In Our Own Stock.

TRANSFORMERS.

600-KVA Westinghouse, 6,600/415 volts, 3-phase, 50 periods.
75-kVA Metro-Vickers, 5,000/220 volts, 3-phase, 25 periods.
75-kVA Hackbridge, 5,000/440 volts, 3-phase, 25 periods.
30-kVA Brush, 5,000/220 volts, 3-phase, 25 periods.
8-kVA Westinghouse, 415/110 volts, 3-phase, 50 periods.

D.C. MOTORS, 440/480 VOLTS.
200 h.p., 50, 40, 38, 35, 30, 28, 25, 20, 18, 17, 15, 10, 8, 5, 3, 2, 1.

D.C. MOTORS, 500/550 VOLTS.
58 h.p., 50, 20, and 10 h.p.

D.C. MOTORS AND DYNAMOS, 200/250 VOLTS.
50 h.p., 30, 27, 25, 20, 12, 10, 7, 5, 3 and 2 h.p.

D.C. MOTORS AND DYNAMOS, 110 VOLTS.
52 kW, 18 kW, and 8-volt, 300-amp. Plating. Dynamos 4.9 kW. Cinema M.G., 440/70 volts, 70 amps.

A.C. MOTORS, 400/440 VOLTS, 3-PH., 50 PERIODS.
200 h.p., 60, 34, 25, 16, 15, 12, 10, 8, 7, 5, 4, 3 and 2 h.p.

A.C. MOTORS, 400/440 VOLTS, 3-PH., 25 PERIODS.
150 h.p., 60, 50, 35, 25, 20, 18, 10, 8, 7, 5, 4, 3 and 2 h.p.

A.C. MOTORS, 200 VOLTS, 2-PH., 50 PERIODS.
60 h.p., 55, 30, 25, 10, 7, 5, 3 and 1 h.p.

A.C. MOTORS, 200 VOLTS, 3-PH., 50 PERIODS.
10 h.p. and four 5 h.p.

GENERATING SET.
26 kW Parsons-B.T.H., 100/150 volts, d.c., petrol-paraffin.

Very large stock of Instruments, Switchgear, and general Electrical Material. All plant fully guaranteed. Inspection invited.

MIDLAND COUNTIES ELEC. ENG. CO., LTD.,
Grice Street, Spon Lane, West Bromwich.
Telegrams: "Rheostat-West Bromwich." 1

LAMPS! LAMPS!! LAMPS!!!

OWING to advantageous buying,

THE UNIVERSAL ELECTRIC LAMP CO.,
of Universal House, 89, Great Eastern Street, E.C.2,
are able to offer
GUARANTEED ELECTRIC LAMPS
at
KNOCK-OUT PRICES.

Write or call for our list of CLEARANCE LINES in METAL FILAMENT at **5s. 3d.** per dozen.
and
HALF-WATT TYPE from **6s. 6d.** per dozen.

We also stock Ferro Watt Gasfilled (Clear and Opal), Sign, Metal Filament, Traction, Half Watt Type (Clear and Opal), Candle, Carbon, Autobulbs and Natural Coloured Glass in all voltages, and guarantee you against
ANY INFRINGEMENT OF PATENT RIGHTS.

Telephones: Cent. 2777, 2778, Tott. 1655.
Telegrams: "Youwelko, Finsquare, London." 23

GAS ENGINE FOR SALE.

80-H.P. Bates & Scholes Gas Engine, in perfect condition. Can be seen running by appointment. Can be converted to crude oil.—Apply

F. W. LANGLEY & CO.,
Hanley,
Stoke-on-Trent.
'Phone: Hanley 2795. 2638

DIESEL ENGINES.

SEVERAL unused 2,000/3,000 b.h.p., M.A.N. Diesel Engines for disposal at attractive prices.

These engines are especially suitable for dealing with peak and emergency loads in large power stations, or as the main generating sets in moderate size stations. Immediate delivery.

Full details from J. W. R. WRIGHT, 66, First Avenue, Gillingham, Kent. 1887

FOR SALE.—*Continued.*

MYLAN & SMITH (ENGINEERS), LTD.

Every Item in our own Stock.
ALL Guaranteed for Six Months.

Thoroughly overhauled and tested before despatch.

THREE-PHASE, 50 PERIODS, 400/440 VOLTS.

Stock.	H.P.	Speed.	Winding.	Maker.
Five	35	940	slip ring	Fuller
One	40	720	,,	Met.-Vick.
One	50	960	,,	Jydsk
One	50	323	,,	Siemens
One	60	720	,,	Met.-Vick.
One	125	485	,,	Brush
One	200	733	,,	Newton Bros.
One	330	575	,,	Westinghouse
One	440	490	,,	E.C.C.
Two	50	964	squirrel-cage	Newton Bros.
One	60	720	,,	L. D. & M.

THREE-PHASE, 50 PERIODS, 500 VOLTS.

Stock.	H.P.	Speed.	Winding.	Maker.
Three	50	940	slip-ring	Fuller
One	75	323	,,	Siemens
One	125	485	,,	Brush
One	200	733	,,	Newton Bros.
One	375	575	,,	Westinghouse
One	50	964	squirrel-cage	Newton Bros.
Two	60	720	,,	L. D. & M.

THREE-PHASE, 50 PERIODS, HIGH TENSION.

Stock.	H.P.	Speed.	Volts.	Winding.	Maker.
One	65	1450	2750	slip-ring	English Elec. Co.
One	430	500	3200	,,	G.E.C.

DIRECT CURRENT, 110 VOLTS.

Stock.	H.P.	Speed.	Winding.	Maker.
Three	1½	240	shunt	Holmes
One	2	800	,,	Siemens
One	3¾	525	,,	Verity
Two	5	1000	,,	G.E.C.
One	5	600	,,	,,
One	6½	280	,,	Holmes
One	7½	475	,,	L. D. & M.
One	10	1000	,,	Crompton
One	10½	650	,,	Westinghouse
One	18	430	,,	,,
Two	25	800/1000	,,	,,
One	30	840	,,	,,
One	61½	540	,,	Electromotors

DIRECT CURRENT, 220/230 VOLTS.

Stock.	H.P.	Speed.	Winding.	Maker.
One	1	1000	shunt	G.E.C.
One	1½	750	,,	Vickers
Three	2½	840/950	,,	Royce
One	2½	675	,,	Holmes
Three	2½	500	,,	,,
One	4	700/1400	,,	Newtons, T.
One	5	750	,,	Elec. Co.
One	5	150/440	,,	H. Green
One	6	470	,,	Westinghouse
One	6	400	,,	G.E.C.
Two	6	380	,,	E. Brown
One	6	375	,,	B.E.P.
One	7	490	,,	L. D. & M.
One	7½	1050	,,	Verity
One	10	1200	,,	G.E.C.
One	12½	560	,,	Holmes
One	15	950	,,	L. D. & M.
One	18	310	,,	,,
One	123	1080	,,	Electromotors

DIRECT CURRENT, 440/500 VOLTS.

Stock.	H.P.	Speed.	Winding.	Maker.
Three	4½	1600/1900	shunt	Royce
One	5	1170	,,	B.T.H.
One	10	300/900	,,	H. Green
One	12	940	,,	Westinghouse
One	12	800	,,	G.E.C.
One	12	760	,,	B.T.H.
One	12	750	,,	B.E.P.
One	13	700	,,	G.E.C.
One	14	980	,,	L. D. & M.
One	15	1050	,,	,,
Four	20	500	series	Laurence, Scott
One	36	620	compound	L. D. & M.
One	38	660	,,	,,

The above represents only a small selection of our stock. Please send us your enquiries.

MYLAN & SMITH (ENGINEERS), LTD.,
KELVIN HOUSE, ST. JAMES STREET, SHEFFIELD.
'Phone: 21371 & 21372, Sheffield.
'Grams: Topical, Sheffield.
Works: Bamford, Derbyshire, L.M.S. Railway. 3

FOR SALE.—*Continued.*

SOUTH SHIELDS UNION.

Old Plant for Sale.

THE Guardians of the above-named Union have the following old plant for dismantling and disposal at their Harton Institution, near Tyne Dock. Inspection may be had upon application to the "Master, Harton Institution, South Shields," from whom any further information required may be obtained.

Sealed tenders for the whole or part of the material, as and where it at present stands, addressed to "The Clerk to the Guardians, South Shields," and endorsed "Tender for old Plant," should be delivered by Tuesday, the 10th July.

Two Lancashire Boilers, each 22 ft. long by 6 ft. 6 in. dia.
One Lancashire Boiler, 28 ft. long by 6 ft. 6 in. dia.
} Complete with all mountings. 25 years old. Purchase price to cover "on present seatings."

One Tangye Feed Pump (now at work) 9 in. steam end, 6 in. water end.
One Worthington Feed Pump (now at work), 6 in. steam end, 4 in. water end.
One Cylindrical Storage Tank, 10 ft. 6 in. long by 6 ft. dia. by ⅜ in. plate.
One Rectangular Storage Tank, 6 ft. by 5 ft. by 4 ft. by ¼ in. plate.
One Dressing Steriliser complete with containers.
One Belt Driven Fan and Hot-air Heater, complete with trunking.
One Steam Fumigator.
Cast Iron per cwt.
Wrought Iron per cwt.
Brass per lb.
Copper per lb.
Lead per lb.
Zinc per lb.

The Guardians do not bind themselves to accept the highest or any tender.

By Order, J. W. COULSON,
2685 Clerk to the Guardians.

LAMPS.

BUY FROM ONE OF THE OLDEST LAMP FIRMS IN LONDON.

YOU are not buying the best lamps on the market, at the lowest prices in London, if you are not buying from us.

Deliveries guaranteed from 1 to 500,000 lamps throughout the year.

METAL-FILAMENTS.
TRACTION TYPE.
HALF-WATT TYPE CLEAR AND OPAL.
NATURAL COLOURED METAL-FILAMENT.
CANDLE TYPE.
SIGN LAMPS (also in 7- and 14-V small cap).
EVERYTHING IN AUTO BULBS (at manufacturers' prices).
ELECTRICAL ACCESSORIES, CABLE, WIRELESS VALVES, REFLECTORS, &c. (at lowest prices).

All goods unconditionally guaranteed.

Write for price list.

L. BENN & CO., LTD.,
60, Camomile Chambers, Camomile Street, E.C.3.
Telephone: Avenue 3771-3772. 6823

PICKINGS FROM OUR NEW LIST.

C.G. and S.C. Lampholders	4/3 doz.
S.C. Batten Holders	4/6 ,,
5-amp. Plugs and Sockets H.S.	10/6 ,,
10-amp. Plugs and Sockets H.S.	16/6 ,,
5-amp. Flat P.B. Switches	6/3 ,,
5-amp. Flat O.C. Switches	7/11 ,,
5-amp. Flat White Covers	9/9 ,,
5-amp. Brown Bakelite Covers	9/9 ,,
I.W. Pear Switches	7/9 ,,
1-way O.C. Switch Plates	4/- ,,
2-way O.C. Switch Plates	5/6 ,,
1-way Sunk Boxes	1/11 ,,
2-way Sunk Boxes	3/11 ,,
Fuseboards, 2-way sq. pattern	3/10 each
Fuseboards, 2-way oblong pattern	4/- ,,
Alabaster Bowls, 12 in. with O.C. Fittings ...	13/4 ,,
1/.044 V.I.R. Cable	7/- per 100 yds.
1/.044 Twin Lead	29/- per 100 yds.

New List Post Free.

ENTERPRISE, Grape Street, W.C.2. 2672

FOR SALE.—*Continued.*

ELECTRIC LAMPS.

A Consignment of First Class

CARBON FILAMENT LAMPS

in all standard voltages and C.P. has just arrived.

INTERNATIONAL LAMPS,

National House,

92, Turnmill Street, London, E.C.1.

'Phone: Clerkenwell 8590. 2727

NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO., LTD.

Important Sale of Direct Current Meters.

OWING to various portions of the system having been changed over from direct to alternating current, the above company is prepared to dispose of its surplus stock of direct current Meters on very favourable terms. They have for disposal 5-ampere and 10-ampere Meters of the Chamberlain and Hookham square type (Mercury ampere-hour), which will be put in perfect order, made suitable for any voltage up to 500 volts, and painted black, green or blue at choice, at £1 each, irrespective of size. Packing and carriage extra, at cost.

On quantities of 50 or more for one voltage and current, a reduction of 10 per cent. will be made.

Inquiries should be addressed to: The Engineer, Testing Department, Newcastle-upon-Tyne Electric Supply Co., Ltd., Pandon Dene Test House, Ellison Place, Newcastle-upon-Tyne. 2737

CABLES, &c., FOR SALE.

CABLES, V.I.R., T. & B.—New English, 1/.044 to 127/.103 at 50 per cent. below makers' to-day's net trade prices.

C.T. & T.R.S. Cables, all sizes, in single, twin and three-core, from .003 to 1.25 sq. in., by leading English manufacturers. New and cheap.

Bare Copper Aerial Cables—all sizes to .25 sq. in., at 77s. per cwt. V.I.R.L.C. Cables—3,000 yds. new .15 sq. in. twin core, by Glovers, on original 250-yd. drums; also all other sizes in single, twin and three-core. C.T.S. Flex, 40/.0076, 70/.0076, and 110/.0076, in single, two and three-core. All new, by English manufacturers, at 33⅓ per cent. off list.

Colliery Cables—1/.044-3/.036 and 3/.044 V.I.R.L.C.W.A. and Braided Cables. Brand new cables on maker's original drums, at less than 50 per cent. below to-day's trade prices.

BURLEIGH, 45, Hornsey Road, London, N.7.
'Phone: North 1675. 2098

MOTORS, DYNAMOS, &c.

EXTENSIVE range a.c. and d.c. standard voltages and h.p. Wallwork Worm Gears, 25 and 30 h.p.
225-h.p. and 120-h.p., 500-V, d.c. Motors, by Metro-Vickers.
500-h.p., 3,000-V, 3-ph., 50-per., 291 revs., B.T.H.; would re-wind for other voltages.
200 h.p., 418 revs., 400 V, 3-ph., 50 per.
300 h.p., 290 revs., 400 V, 3-ph., 50 per.
220-V Dynamos, 70, 210, 100 and 110 kW.
Auto-Contactor Starter, 80 h.p., 400 V, 3-ph., 50 per.
Alternators, 35 kVA, 3-ph., 50 per., 440 and 220 V.
Plating Dynamo, 6 V, 500 A, and 15 V, 1,500 A.
Transformers: 12 kW and 30 kW, 3-ph., 50 per., 500/100 V; 10 kW, 3-ph., 50 per., 480/220 V.
Many Variable Speed Motors.
GREENHALGH BROS., ATHERTON. 'Phone: 117. 21

ELECTRIC MOTORS AND DYNAMOS.

WE hold one of the largest Stocks of New and Second-hand Motors. Second-hand Machines are thoroughly overhauled. Inspection and Tests can be made at our Works.

24 pp. Catalogue free on request.

For Sale or Hire. Send your inquiries to Messrs.

BRITANNIA MANUFACTURING CO., LTD.,
22-26, BRITANNIA STREET,
CITY ROAD, LONDON, N.1.
Telephone: 5512-3 Clerkenwell. 13

FOR SALE.—*Continued.*

BOROUGH OF WEYMOUTH AND MELCOMBE REGIS.

THE Corporation Electricity Department have for disposal Three Lancashire Boilers by Danks of Oldbury.

Working pressure 160 lbs., size 28 ft. by 8 ft., date of make 1904.

The plant is open for inspection by appointment, and offers can be made to

GEO. NICHOLSON,
Borough Electrical Engineer.
Weymouth, June 26th, 1928. 2701

GENERATING SETS, 50 kW.

EACH comprising a 100-h.p. "Aster" petrol-paraffin engine, direct-coupled to a Siemens Generator, with cooling tanks and high-grade, three-panel switchboard. Brand new. In stock, any voltage, 80/550, and in d.c. and a.c., 3-phase, 50-period types, at less than half manufacturers' price. Inspection Spalding.—Farrow & Sons, Ltd., Spalding. 2168

CASH OR HIRE PURCHASE.

400 D.C. and a.c. Motors in London Stock. A new machine with a guarantee is a cheaper propositicn.

Ring City Electrical Co., Emerald Street, Theobald's Road, W.C. 'Phones: Museum 5540, 5541, 5539. 2

Advertisements are inserted under this heading at 1s. 9d. per line.

AERIAL H.T. Switches, 11,000 volts, D.P. and T.P.—Edwardes Bros., 20, Blackfriars Road, London. 6830

A1 quality "Elect" Irons, Kettles, Fires, Heaters. Cheapest. In stock.—Electric Heating Co., Croydon. 2341

ALTERNATING and Direct Current Electric Motors, ½ to 100 h.p., new and second-hand. First-class machines with full guarantee. Hire or sale.—Electro-Generator Co., 5, Uxbridge Road, Shepherds Bush, W.12. Riverside 0488. 6640

AMMETERS, Voltmeters, House Service Meters, a.c. and d.c., new and second-hand, for Sale. Meter and Instrument Repairs of every description.—Victa Electrical Co., 47, High Street, Battersea, S.W. 1266

BARGAINS: D.c. Motors, 110, 230, 460 volt. All sizes in stock. Guaranteed in running order complete with starters. Price approx. £1 per h.p. for larger sizes.—T.P., 12, Bevington Hill, Liverpool. 2718

BELLISS-E.C.C. Steam Generating Set, 500 kW, 3,000-volt, 3-ph., 50 c. 300-kW ditto, 500 volts, d.c. 90-kW ditto, 480/530 volts, d.c.—Harry H. Gardam & Co., Ltd., Staines. 'Phone 98. 2712

CABLES for Sale.—All the Power and Lighting Cables, a.c. and d.c., from 7/16 single to 61/13 three-core, V.I.R., S.W.A., and Lead-covered. Write for price list or call to inspect.—Smail, c/o John Musgrave & Sons' Works, Kay Street, Bolton. 2601

CABLES, 600 Meg. N.A., 1/.044, V.I.R., £3; 3/.029, £4 5s.; Tough Rubber, 1/.044, Single £6 16s., Twin £11 4s. 9d.; 3/.029, S. £8 4s. 8d., Twin £16 1s. 5d. per 1,000 yds.—Withers, Hill Top, West Bromwich. 6818

DIX Onemeter 55 Range Meter, micro and amps., milli and volts, ohms and megs., all on one precision moving coil 55s. meter. Accurate and marvellously cheap.—Lealie Dixon Instruments, 218, Upper Thames Street, E.C.4. 10

EDISON Cells, A4, A6, and A8 types, good, cheap.—Milo Works, Milo Road, E. Dulwich, S.E.22. 6654

ELECTRIC Hot Water Heaters (instantaneous, hygienic, compact). List price £6. Trade price 35s. Illustrated list on application.—Gyles, 5, St. Albans Crescent, London, N.22. 6822

ELECTRIC Motor, 40 h.p., 50 cycles, single phase, commutator type.—2724, Electrical Review, 4, Ludgate Hill, London.

FLEXIBLE.—Twin, red and black, also maroon. Bulk quantities. Keen price.—A. J. Andrews, Audrey House, Ely Place, London, E.C.1. Holborn 1755. 2238

FOR Sale, New Compensated Asynchronous Motor by B.T.H., Ltd., 9¼ b.h.p., 440 volts, 50 cycles, 3-phase, protected type, no lag power factor correction motor. Order cancelled through late delivery. Accept half cost price.—Power Contracts, Ltd., 138, Southwark Street, S.E.1. 2725

FOR Sale, Lalley Lighting Set, 25-volt; good running order. Price £25.—E.N. & Co., Court Road, Sutton. 6780

FOR Sale, direct-coupled oil-driven Generating Sets, from 1 kW to 300 kW, all voltages, a.c. and d.c. Engines, Dynamos and Motors from stock, including two 150-h.p., 415-volt, 3-phase, 50-cycle Motors and M.G. Set, 415-volt, 3-phase, 50-cycle, directly coupled to 11 kW, 220-volt Generator.—Fyfe, Wilson & Co., Ltd., 31, Budge Row, London, E.C.4. 2708

FOR SALE.—*Continued.*

FOR Sale, one 420 h.p., 220 volt, compound, 2-bearing Laurence, Scott Motor, 320 r.p.m. New.—James Grant and Co., 484, Pollokshaws Road, Glasgow, S.1. 2436

LAMPE Union (Manufacturers), rue du Feu, 75, Forest Bruxelles. Metal Filament Lamps of high quality at very low prices for big quantities. 22

LIGHTING Plants.—1, 2, 3, 3½ and 5-kW Austin, Standard, A.B.C. and Petter Petrol-Electric (direct-coupled) Generating Sets, 50-110 and 220 volts; from £25 each.—Inspect, Burleigh, 45, Hornsey Road, London, N. 'Phone: North 1675. 8

MOTOR Generator Set for Sale, output 75 kilowatts at 110 volts d.c.; motor suitable for 410 volts d.c. Can be inspected at R. Hoe & Co., Ltd., 109, Borough Road, S.E.1. 2679

MOTORS and Dynamos in stock. Condition guaranteed.—Drummond & Co., Middlesbrough. 6

MOTORS, a.c. and d.c., all sizes and voltages in stock; Transformers, Pumps, &c.—R. B. Heckie & Co., 11-13, Commerce Street, Glasgow, C.5. 2125

NAMEPLATES in Metal, Ivorine, &c. Bronze and Brass Doorplates.—Stilwell & Sons, 7, Jordan Well, Coventry. 14

NEW Cables, guaranteed quality, 1/.044, 3/.029, 3/.036, V.I.R., taped and braided, 6s. 6d., 8s. 6d., and 10s. 6d. per 100-yd. coil. Send for sample and price list.—Edwardes Bros., 20, Blackfriars Road, London. 6825

NEW V.I.R. Cables, all sizes, 1/.044 to 61/103, also Armoured Cables. Cheap.—Edwardes Bros., 20, Blackfriars Road, London. 6826

NEW lead-covered V.I.R. Cables, 1/.044 twin flat, 13s. 9d. per 50 yd., 3/.029 ditto, 16s. 3d. per 50 yd. Guaranteed quality. All sizes, single and twin, up to 7/.064 stocked.—Edwardes Bros., 20, Blackfriars Road, London. 6827

OIL-Driven Generating Set, 26 kW, Dixon Bros. engine, coupled direct to Mawdsley generator, 225 volts, d.c.—Harry H. Gardam & Co., Ltd., Staines. 'Phone 98. 2715

ONE 750-kW Westinghouse High Pressure Turbine Set, Rateau Turbine 180 lb. steam pressure, 3,000 r.p.m. Generator, 365 volts, 3-phase, 50 cycles, with spare generator rotor, switch board, and condenser. Can be run up to 440 volts by shunt regulation. Being replaced by larger set. In excellent condition.—Joseph Pugsley & Sons, Ltd., Lawrence Hill, Bristol. 2692

OSRAM and Mazda Lamps, 110 V, 20 Watt, M.F., B.C., less 60 per cent. off list.—Edwardes Bros., 20, Blackfriars Road, London. 6832

PETROL-Paraffin Lighting Set, 9 kW, Belliss-Siemens, 110-140 volts. Ditto, by Lister, 8 kW. Immediate delivery.—Harry H. Gardam & Co., Ltd., Staines. 'Phone 98. 2714

POLES, 16 to 40 feet, for hire and sale, suitable for telegraph, transmission, wireless, scaffold, &c.—Sir William Burnett & Co., Ltd., Nelson Wharf, Millwall, E.14. 4

PORCELAIN Insulators and Cleats, large stocks.—Edwardes Bros., 20, Blackfriars Road, London. 6831

PRIVATE Plant, Austen Lighting Set, 100-volt, complete with automatic switchboard and 54 Chloride cells, 84 amp.-hours, charging over to Supply Co. Price £120. Seen by appointment.—E.N. & Co., Court Road, Sutton. 6779

STEAM Generating Sets.—26-kW Allen, 15-kW Belliss, 110 volts, d.c. 60-kW Scott & Mountain, 220 volts. 150-kW Ashworth & Parker, 440 volts, d.c.—Harry H. Gardam & Co., Ltd., Staines. 'Phone 98. 2716

SPECIAL offer, English v.i.r. taped and braided Cable. 7/.029, 11s. 6d. 100 yd. coil; 7/.044, 22s. 6d. coil.—Edwardes Bros., 20, Blackfriars Road, London. 6833

SPECIAL offer, new "Climax" Vacuum Cleaners, 110 volts, plated finish, 70s. each, with accessories complete.—Edwardes Bros., 20, Blackfriars Road, London. 6828

SPECIAL Lines of Switches, Lampholders, Ceiling Roses, Cut Outs, Porcelain Cleats and Insulators up to 30,000 volts, with fittings. Conduit and fittings, Bells, Glass Shades and E.I. Reflectors, Floodlamps, Strip Light, Wood Blocks, Heaters, Volt and Ammeters, Arc Lamp Carbons, Motors, and numerous other lines at low prices.—Edwardes Bros., 20, Blackfriars Road, London. 6829

THREE Vickers-Petters semi-Diesel six-cylinder Oil Engines, 480 b.h.p. each, and one four-cylinder, 340-b.h.p., for Sale; all coupled direct to G.E.C. generators, d.c., 230 volts, 250 r.p.m., 3 to 4 years old. Can be seen any time by appointment. The whole plant being replaced by a larger turbine installation, process steam being necessary.—Apply Olive and Partington, Ltd., Turn Lee Mills, Glossop. 1841

TELEPHONE Cable, about 30 miles 7pr. 10 E. & C.C. lead covered; as used by G.P.O., on makers' original ½-mile reels. Cheap to clear.—Burleigh, 45, Hornsey Road, London, N. 2107

FOR SALE.—*Continued.*

TWO Brand New Vertical Allen Engines, totally enclosed type, semi-portable, dual ignition, 750 r.p.m., 46 b.h.p., complete with one new set of spares. Price £125 each.—R. B. Heckie & Co., 11-13, Commerce Street, Glasgow, C.5. 2124

TWO Ward-Leonard Variable Speed Motor Sets, by Westinghouse, each consisting of a 220-h.p., 365-volt, 3-phase, 50-cycle, a.c. Motor, 730 r.p.m. Driving a 440-volt d.c. dynamo with separate exciter, electrically connected to a 180-h.p. d.c. Reversing Motor, 140 to 840 r.p.m., 3-bearing type, complete with a.c. switch pillar and liquid starter, exciter, motor and dynamo control, with instrument boards of the pillar type. These Sets are suitable for use on 400 volts, 3-phase, 50 cycles supply. In excellent condition.—Joseph Pugsley & Sons, Ltd., Lawrence Hill, Bristol. 2691

WATER Turbines, Pelton Wheels, modern type, ¼ h.p. to 10 h.p., for country house plants. State requirements.—W. Storey, Staveley, Westmorland. 6807

WEIR Feed Pump, 12 in. by 9 in. by 21 in. Ditto, 14½ in. by 10 in. by 18 in. Weir Service Pump, 30,000 galls. per hour.—Harry H. Gardam & Co., Ltd., Staines. 'Phone 98. 2713

1-, 2- and 5-h.p. Motors. Very low prices.—London Electric Firm, Croydon. Purley 1222/3. 2689

3- AND 5-amp. Clockwork Meters, 200 V, 100 cycles; 5s. each. —Electric Heating Co., Croydon. 'Phone 1082. 1438

10-H.P. "Boothroyd" Motor, shunt wound, 230 volt, complete; guaranteed running order. £12.—T.P., 12, Bevington Hill, Liverpool. 2720

25-H.P. Fuller Motor, 415 volts, 3-ph., 50 cycles. 40-h.p. G.E.C., 440 volts, d.c. 20-h.p. Electromotors, 440 volts, d.c. 15-h.p. Crompton, 110 volts, d.c. 5-h.p. Crompton, 110 volts, d.c.—Harry H. Gardam & Co., Ltd., Staines. 'Phone 98. 2717

33-H.P. Pipe Ventilated a.c. Motor, squirrel cage, 720 revs., 400 V, 50 cycles, by B.T.H.; cont. rating. Bargain, £25.—T.P., 12, Bevington Hill, Liverpool. 2721

40-KW Campbell Crude Oil Set, 220/240 volt, d.c., with switchboard and extras.—F. Winkworth & Co., Ascot, Berks. 2728

90-KW Generator, shunt interpole, 220/230 volts, 400 amps., 800 revs., 3 bearing, mounted on bedplate.—T.P., 12, Bevington Hill, Liverpool. 2719

120-KW Belliss Crompton Steam Generating Set, w.p. 100/125 lb., 220 volt, d.c., complete with condenser.—James Grant & Co., 484, Pollokshaws Road, Glasgow, S.1. 2545

150-H.P., 440-V, 3-ph., 50 per., 585 revs., B.T.H., with controller and continuously rated resistance.—Greenhalgh Bros., Atherton. 2486

200-VOLT Single-phase Motors for Sale: 7½ h.p. slip ring, 5 h.p. slip ring, 5 h.p. squirrel cage, three 3 h.p. squirrel cage. One 1 h.p. Commutator Machine complete with starters, pulleys and switches. For sale owing to changing over to higher voltage. Immediate sale.—Garty, 16, Balham Hill, Balham, S.W.12. 6819

275-KW Rotary Convertors, Metro-Vick, 50 per.; output 400/500 V, d.c. As new. Seen running.—Greenhalgh Bros., Atherton. 2705

300-KW rope-driven Generator, by J. P. Hall & Co., Ltd., Oldham, compound wound, 215 volts, d.c., 1,400 amps., 350 r.p.m., 3 bearings, heavy bedplate. Good condition. For disposal because of change-over to a.c. supply.—2658, Electrical Review, 4, Ludgate Hill, London.

500-KW Rotary Convertor with Transformer, 6,600 volts, 50 cycles, to 480 V, d.c. £700.—6787, Electrical Review, 4, Ludgate Hill, London.

ARTICLES WANTED.

Advertisements are inserted under this heading at 14s. per inch.

WANTED.

MESSRS. Edwardes Bros. wish to announce that they are open to purchase Surplus Stocks for net spot cash. Full particulars with samples will receive immediate attention.—Edwardes Bros., 20, Blackfriars Road, London, S.E. 'Phone: 2115 Hop. 6834

Advertisements are inserted under this heading at 1s. 9d. per line.

ADD us to your list of buyers of old Electric Cable, Generating Sets, Brass, Copper, &c. It will pay you.—Midland Iron & Hardware Co., Ltd., Cradley Heath. 'Phone: 624 Cradley. 1910

ASK us to buy your Scrap Electric Cable, old Plant, and non-ferrous Metals. Highest prices paid.—Jewell & Son, Oldbury, near Birmingham. Telephone: Oldbury 96. 15

ARTICLES WANTED.—*Continued.*

BATTERIES (Storage), old Dynamos, Transformers, Arc Lamps, Electric Meters, Scrap Cable, Metals, or Machinery of any description purchased. Distance no object. —A. Learoyd & Son, Bridge Works, Heatherley Street, Clapton, London. Telephone: Clissold 2278. Established 1860. 6587

KOHLER Plant required, part used; Model D. or K. preferred.—Condition, &c., 6800, Electrical Review, 4, Ludgate Hill, London.

ONE Motor Generator, about 10/15 kilowatts, with the motor for use on 440/460 volts, d.c., and generator to give 10 volts.—The Electro Mechanical Brake Co., Ltd., Moor Street, West Bromwich. 2742

ONE Motor Alternator, about 5 kilowatts, with the motor for use on 440/460 volts, d.c., and the alternator to give 650 volts, 50 cycles.—The Electro Mechanical Brake Co., Ltd., Moor Street, West Bromwich. 2743

ONE motor driven 5-kW Testing Generator, with the motor for use on 440/460 volts, d.c., and generator to give 650 volts, d.c., and 650 volts, a.c., at 50 cycles.—The Electro Mechanical Brake Co., Ltd., Moor Street, West Bromwich. 2744

SCRAP Accumulator Plates and Sediment wanted. As actual smelters we are able to pay top prices, any quantities.—'Phone or write, Elton, Levy & Co., Ltd., Brettenham Road, Edmonton, N.18. 'Phone: Tottenham 2412-3-4. 2478

WANTED, 40/60-kW Crude Oil or Suction Gas Generating Sets, 220 V, d.c.—2723, Electrical Review, 4, Ludgate Hill, London.

500-KW Alternator Set wanted, 440 volts, 3-phase, 50 cycles. Steam 180 lb. Turbine or reciprocating. Larger output considered.—State full details, age, fittings, &c., Sloan & Lloyd Barnes, 34, Castle Street, Liverpool. 6809

AGENCIES.

Advertisements are inserted under this heading at 14s. per inch.

AGENCIES.

A GENTLEMAN (at present engaged) with proved sales record and connection with electrical engineers and factors throughout Scotland desires to hear from a first-class British firm manufacturing electrical goods who require an experienced Representative and Organiser in that territory. Past sales record and highest references available.—"Electrical," Wm. Porteous & Co., Glasgow. 6781

Advertisements are inserted under this heading at 1s. 9d. per line.

AGENTS.—A well-known Company handling the latest type of enclosed bag Vacuum Cleaner, is prepared to consider appointing part-time Representatives throughout the country. Exclusive territories will be allotted with commission to the representative on all orders from such territory whether secured by the representative or received direct. Applications are desired from men handling non-competitive lines who already have an established connection with the electrical industry, including supply companies, factors and traders, and are able to devote a proportion of their time to this business. —Write in confidence as to existing connection and lines carried to 2651, Electrical Review, 4, Ludgate Hill, London.

AGENTS are required for the Provinces for a well-known "Non-Ring" Lamp for the coming season. Territories granted on favourable terms to reliable firms or individuals who can show prospects of big business. Full programme now available.—2734, Electrical Review, 4, Ludgate Hill, London.

AGENTS, to sell high quality but keen priced irons, kettles, fires, &c. Commission only.—2690, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL goods and motor accessories manufacturer requires established firm to act as Sole Agent for Irish Free State. Could arrange consignment stock. Only firms with travellers need apply.—2621, Electrical Review, 4, Ludgate Hill, London.

EXPERIENCED Electrical Mechanical Sales Engineer, A.M.I.C.E., A.M.I.E.E., requires Sole Agency in Birmingham district for first class competitive product in industrial electrical machinery, accessories or fittings.—Apply 6805, Electrical Review, 4, Ludgate Hill, London.

HAVE you a S. African Agent? Gentleman of position, sailing August, would like to Represent one or two first-class houses.—6797, Electrical Review, 4, Ludgate Hill, London.

LIVE Agents wanted for sale on commission basis of high-class commercial and industrial lighting fittings, electricity meters, and other electrical equipment for North-East Coast and Northern Ireland.—2680, Electrical Review, 4, Ludgate Hill, London.

WELL-Known Electrical Engineer with own car and first-class connection in Lancashire and Midlands, requires one or two good Agencies. Can give excellent results.—6802, Electrical Review, 4, Ludgate Hill, London.

BUSINESSES FOR SALE AND WANTED.

Advert'sements are inserted under this heading at 1s. 9d. per line.

ELECTRICAL Contracting and Wireless Business and Official Battery Service Station for Sale, Liverpool district. Turnover £3,500. Price £500. Stock and plant at valuation. Complete set of books kept.—6712, Electrical Review, 4, Ludgate Hill, London.

WANTED, small but sound Electrical Business. Under £500.—6776, Electrical Review, 4, Ludgate Hill, London.

£1,400 CONTRACTOR'S Business. Est. 20 years. Stock, plant. City, main thoroughfare. Lease. Low rent.—6796, Electrical Review, 4, Ludgate Hill, London.

PARTNERSHIPS.

Advertisements are inserted under this heading at 1s. 9d. per line.

PARTNERSHIP wanted in General and Electrical Machine Repairs Business with a source of water power nearby. North mid area. Invest £200.—Details to T. Roper & Co., Accountants, Bromsgrove. 6789

MISCELLANEOUS.

Advertisements are inserted under this heading at 14s. per inch.

COLOURING (Opaque and Transparent).

FROSTING (with Acid).

RECAPPING.

If you have an urgent job, send it to

MULTI-COLOURING CO.,

92, Turnmill Street, London, E.C.1.

'Phone: Clerkenwell 8590.

It will be done while you wait.

Special terms to the wholesale trade. 2726

Advertisements are inserted under this heading at 1s. 9d. per line.

ADVANCEMENT Professionally, also earliest success at A.M.I.E.E., A.M.I.Mech.E., B.Sc.Eng., &c., is what "U.E.C." spare time training offers you! (Thousands successful. Estd. 1906.)—Advice and full particulars of Individualised Correspondence Courses free from Advisory Secretary, University Engineering College, Westgate-on-Sea, Kent. 6737

ELECTRIC Signs at lowest prices. Write for Designs.—King Signs, Ltd., 23, Collingwood Street, S.E.1. 6090

ELECTRICIAN wants piecework; lighting, bells, telephones, power. Trade preferred.—22, White Lion Street, E.1. 'Phone: 7175 Bishopsgate. 6795

ENGINEERS. Do you want a good job? "The Engineer's Guide to Success" will tell you how we have helped over 10,000 Engineers and we can help you. Send for free copy to-day. 40 Engineering Courses arranged for home study fully described. Preparation for A.M.I.E.E. and all Engineering examinations. Tuition until pass. No time limit. Advice free.—The Technological Institute, Est. 1918, 231V, Temple Bar House, London, E.C.4. 1291

ENGINEERS!—Do you realise that the A.M.I.Mech.E., A.M.I.E.E., or A.M.I.A.E., &c., is a certain passport to a well-paid post? We can quickly prepare you for these examinations in your own home. In our free 70-page book Prof. A. M. Low tells of the opportunities you are missing. This book gives details of all Eng. Exams. and Courses. We guarantee "no pass—no fee." Write now—state subject or exam.—British Institute of Engineering Technology, 12, Shakespeare House, Leicester Square, London. 6571

EPALTRICAL.—Repairs and overhauls. Armatures rewound. Motors for hire during breakdowns and for all temporary purposes. Competitive terms.—E. P. Allam & Co., Ltd., 107, Grays Inn Road, W.C.1. Holborn 5833. "Epaltrical," Holb., London. 1115

MACHINE Engraving on all instruments and wireless parts. Metal or ivorine labels and name plates.—S. & A. Herd, 29, Theobalds Road, W.C.1. 6648

Where Advertisements are to be answered to a given number at the ELECTRICAL REVIEW Office Applications for Names and Addresses of the Advertisers will be entirely disregarded, and Letters giving incorrect Box Numbers will be destroyed.

LIST OF BOOKS

PUBLISHED BY

THE ELECTRICAL REVIEW.

THE ELECTRIC TRAMCAR HANDBOOK. For Motormen, Inspectors and Depôt Workers By W. A. AGNEW. Eighth edition, **3s. 6d.**, post free **3s. 8d.**

THE PRACTICE OF ELECTRICAL WIRING. By DONALD SMEATON MUNRO, M.I.E.E., M.Assoc. Mining E.E. Written by an Expert, this well-known Handbook is of the greatest possible value to Contractors, Engineers, Architects, Wiremen and all connected with Electrical Wiring. Latest enlarged edition. 267 pp. 100 illustrations. **5s.** net, post free **5s. 4d.**

ELECTRICITY SUPPLY COSTS AND CHARGES. By H. M. SAYERS. M.I.E.E. The following subjects are dealt with at length :—Capital Charges—Stand-by Costs—Load Factor and Maximum Demand—Diversity Factor—Differentiation of Station Costs — Distribution Costs—Administration and General Expenses, and the Relation of Costs and Prices. **2s. 6d.** net, post free **2s. 8d.**

"Every engineer connected with the Electricity Supply Industry will find much of interest and direct value in Mr. Sayers' careful analysis of the various factors which affect the costs of generation and distribution of electricity and their relation to the charges which should be made to the consumer."

THE COAL CONSUMPTION OF POWER PLANTS & BONUSES FOR COAL SAVING. By R. H. PARSONS, M.Can.Soc.C.E. Assoc.M.Inst.C.E. 24 pp.
Paper covers, **1s.**, post free **1s. 2d.**

HANDBOOK IN CABLE-BREAK LOCALISATION. Graphic Methods. The Calculator Board in Practice. By EDWARD RAYMOND-BARKER, M.I.E.E. Demy 8vo, 66 pp., 38 illustrations.
Paper covers, **1s. 6d.**, post free **1s. 8d.**
Cloth „ **2s. 6d.**, „ **2s. 8d.**

CABLE - FAULT LOCALISATION GRAPHS IN PRACTICE. By EDWARD RAYMOND-BARKER, M.I.E.E. Demy 8vo, 68 pp., 24 illustrations
Paper covers, **1s. 6d.**, post free **1s. 8d.**
Cloth „ **2s. 6d.**, „ **2s. 8d.**

GRAPHS IN A CABLE-SHIP DRUM-ROOM : Notes for Junior Assistants. By EDWARD RAYMOND-BARKER, M.I.E.E. Limp cloth, cut flush, 48 pp., 25 illustrations, including 10 photo-engravings. 4 tables. Super Royal 8vo. **1s. 6d.** net, post free **1s. 8d.**

THE CONDUCTOMETER AND ELECTRICAL CONDUCTIVITY. By ROLLO APPLEYARD. Limp cloth, 40 pp. **1s. 6d.**, post free **1s. 8d.**

UNIVERSAL METHODS FOR COMPUTING THE SPEED OF A TELEGRAPHIC MESSAGE SENT BY AUTOMATIC TRANSMITTER OR HAND-KEY. By J. RYMER-JONES, M.I.E.E. **4s.** net, post free **4s. 2d.**

Illustrated by practical examples obtained with the syphon recorder and Morse recorder. The treatise contains, among other data, a comparison between the speed efficiency of the *International* and *American* codes.

LOCALISING HIGH - RESISTANCE BREAKS IN CABLES. By J. RYMER-JONES. Demy 4to. Paper cover. **1s.**, post free **1s. 2d.**

SOME PRACTICAL NOTES ON THE COMMERCIAL DEVELOPMENT OF ELECTRICITY SUPPLY UNDERTAKINGS. By R. BORLASE MATTHEWS, Wh.Ex., A.M.I.C.E. Demy 8vo, 48 pp. Paper covers, **1s.**, post free **1s. 2d.**

ELECTRICAL ACCIDENTS & THEIR PREVENTION. Hints for those employed on or near electrical equipment in factories, workshops, power stations, &c., based on H.M. Factory Inspectors' Reports.
Price **6d.**, post free.

Special terms for large quantities as under :

50 Copies	... ...	£1 0 0	post free
100 „	... ...	£1 18 0	„
250 „	... ...	£4 12 6	„
500 „	... ...	£9 0 0	„

SUGGESTIONS FOR DEALING WITH APPARENT DEATH FROM ELECTRIC SHOCK should be in every Generating, Transforming and Motor House.
Chromo Art Paper, **6d.** each, post free **7d.**
Mounted on Linen, with Rollers, **2s.** each, post free **2s. 3d.**
Mounted on Cardboard, **1s. 6d.** each, post free **2s.**
Reproduced on Galvanised Iron **4s.** each, post free **4s. 9d**

THE ELECTRICAL REVIEW, Ltd.,
4, LUDGATE HILL, LONDON, E.C.4.

Society of Technical Engineers,

102, Belgrave Road,
'Phone : Victoria 4144. **London, S.W.1.**

Second Number of

The Management Bulletin

*

The second number of the Management Bulletin of the Society is now ready. With a view to making this side of the work of the Society better known to technical engineers generally, a limited number of copies (produced by cyclostyle and without advertisements) can be obtained on application, price sixpence post free.

The main features of this number are the full text of a Paper recently read before the Society on "Current Office Organisation" and a Questionnaire dealing with the possibilities of further simplification and standardisation of component parts of engineering apparatus. Technical engineers interested in the latter subject, even if not members of the Society, are invited to assist in the Inquiry covered by the Questionnaire.

CONTENTS.

	PAGE
Report of Rationalisation Committee ...	19
Visit to Home Office Industrial Museum ...	20
Specifications	21
Pitman's Dictionary of Industrial Administration	22
Inquiry Undertaken by the Society Relating to Stock Components of Engineering Apparatus	23
Questionnaire	24
Some Achievements of the B.E.S.A. ...	25
Current Office Organisation : Paper read before the Society by Mr. N. Gerard Smith, M.I.P.E.	27
Official Committee on Simplification ...	41
Management Bulletin Supplement : First list of American Management Association Publications now available to Members of the Society	1-11

THE DIX-ONEMETER

is a precision instrument of universal use, with an ingenious system of multipliers which enable full-scale readings of any value to be made over a wide range. One millivolt to 2000 v., or 50 ohms to 50 megohms. Mirror scale, jewelled knife edge.

A £10 *de luxe* Model for - - 55/-.

Multipliers - - - - - 6/6 each.

ARC LAMPS for Lab, Cinema or Searchlight 10 to 100 amps. 6 geared hand movements. New condition. Only **60/-.**

ELECTRIC PROJECTORS. For Photo Slide or Home Television experiments. 4 Magnif. and focus lenses, swivel stand. Socket cord and plug for supply mains or battery. Sale **25/-.**

IMMERSION HEATERS. Ediswan 12/6 Model. Any voltage. In case with flex and adaptor. Sale **5/-.**

BATTLESHIP TELESCOPES. 2½ in. dia. 24 in. long, in case. SIX LENSES. Internal Slide. Cost £20. Sale **17/6.**

OUR NEW 72-PAGE CATALOGUE IS NOW READY.
Over a thousand bargains are listed and hundreds illustrated.

Leslie Dixon & Co.,

218, UPPER THAMES STREET, LONDON, E.C.4.

"ZAPON" ENAMEL

for all electrical fittings

"Zapon" Enamel is a cellulose finish that is especially suitable for electrical equipment. It has perfect flowing qualities and is exceptionally easy to use. Dries hard and brilliant, and is smooth, even-surfaced, and it is extremely durable. "Zapon" Enamel is manufactured by a firm with 40 years' experience of cellulose finishes.

FREDK. CRANE CHEMICAL CO. LTD.,
Armoury Close, Bordesley Green, BIRMINGHAM
Phone: Victoria 417 and 418. Wires: "Chemical, Birmingham."

Agents:
LONDON: F. Lett & Co., 25 Great Sutton Street, E.C.1.
LEEDS: Ross & Co. (Leeds) Ltd., Trinity Street.
GLASGOW: Calder & Armour, 14 Broomielaw.
EDINBURGH: Anderson, Gibb & Wilson, Blackfriars Street.

For further particulars and list of Crane Products, write or send this coupon to the above address.

Name .....

Address .....

.....

Electrical Review

D.W.O. High Grade Resistance Wires.

Nickel Chrome and Nickel Copper for Heating Units. Electric Irons. Switchgear, etc., for HIGH and LOW Temperatures.

Immediate delivery Stock Sizes.
Write to-day for prices.

FREDK. J. GORDON & CO., LTD.,
92, Charlotte St., London, W.1.
Telegrams: Normality, London. Telephone: Museum 5189.
Birmingham Agent: F. G. Ketelbey, A.M.I.E.E., 14, New St.
Telephone: Central 6633.

THE

ELECTRIC TRAMCAR HAND-BOOK

FOR MOTORMEN, INSPECTORS, and DEPÓT WORKERS.

3/6 NET.

Eighth Edition.

Post free, 3s. 8d.

BY W. A. AGNEW.

The ELECTRICAL REVIEW, Ltd.,
4, Ludgate Hill, London, E.C. 4

ELECTRICAL REVIEW

Trade Names Supplement

Issued Quarterly to approximately

14,000 READERS

of the REVIEW.

If your trade name has not appeared, send for form to:

THE ELECTRICAL REVIEW, LTD.,
4, Ludgate Hill, London, E.C.4.

H.

EBONITE

OF ALL STANDARD QUALITIES AND TO ALL USUAL SPECIFICATIONS.

SEPARATORS, BOXES & FITTINGS FOR ACCUMULATORS OF ALL TYPES.

PUMPS, TAPS, PIPES, &c., for CHEMICAL ENGINEERING.

SOLID EBONITE HORNS FOR LOUD SPEAKERS. The non-resonant properties of Ebonite is now being fully recognised by wireless manufacturers and the demand for these to replace metal and similar horns is rapidly extending. We have the *experience of years* behind us in this specialised branch and would be glad to place same at your disposal. Let us send you our illustrated list.

EBONITE FOR ALL **WIRELESS** PURPOSES.

100% EBONITE ONLY.

EBONITE FOR ALL **ELECTRICAL** INSULATION.

WHOLESALE ONLY. SEND US YOUR ENQUIRIES OR WRITE FOR LIST.

HIGHTENSITE & EBONITE MFG. Co., Ltd.,

Phone: Albert Dock 1157. NORMANDY WORKS, CUSTOM HOUSE, LONDON, E.16.

E.

VINCENT

The Switch Splitter

was first standardised as an efficient and economical accessory for installation work by Vincent, and supplied by them to the Birmingham Electric Supply Department and other authorities.

Although many similar types of apparatus have since appeared, the original features of construction and design which gave them the lead are still exclusive to Vincent.

We hold large stocks at our LONDON House:

The Enterprise Manufacturing Co., Ltd.,
Electric House,
Grape Street, Shaftesbury Avenue, W.C.2.

OUR OTHER SERVICE AGENTS are as follows:
GLASGOW: Alston & Blyth, 97, Waterloo Street. DUBLIN: R. Garmany, 2, Chatham Street, (Grafton Street). BELFAST: R. Garmany, 7, Union Street. NORTH-EAST COAST: J. A. Woods, A.M.I.E.E., 7, Stonyhurst Road, Gosforth, Newcastle-on-Tyne. LINCOLNSHIRE: H. Holt, 43, Hall Gate, Doncaster. WEST OF ENGLAND: Brunwee Ltd., 28, Cumberland Street, St. Paul's, Bristol. WEST RIDING OF YORKSHIRE: The Mechanical and Electrical Engineering Co., Hereford Street, Sheffield. MANCHESTER: Boorne & Co., 196, Deansgate, and all ELECTRICAL WHOLESALERS.

VINCENT SWITCHGEAR MANUFACTURING CO. LTD.

Sampson Road North, BIRMINGHAM.

W.H.W.

—on *Hire-Purchase Terms*

IN introducing these leading Vacuum Cleaners and Floor Polisher to your customers, you can offer them on easy and convenient HIRE-PURCHASE TERMS, and be assured of your full trade discount, irrespective of how the sale is effected.

Send for price lists and complete particulars of the scheme.

METRO-VICK SUPPLIES Ltd.
(Proprietors: Metropolitan-Vickers Electrical Co., Ltd.)
155, Charing Cross Road, LONDON, W.C. 2.

PRICES

VACUUM CLEANERS:
(Complete with set of 7 attachments)
MET-VICK ASPIRON illustrated above, **£15**
MET-VICK CADILLAC illustrated on right, **£15**

FLOOR POLISHER:
MET-VICK DUPLEX illus. on left, **£12 : 12s.**

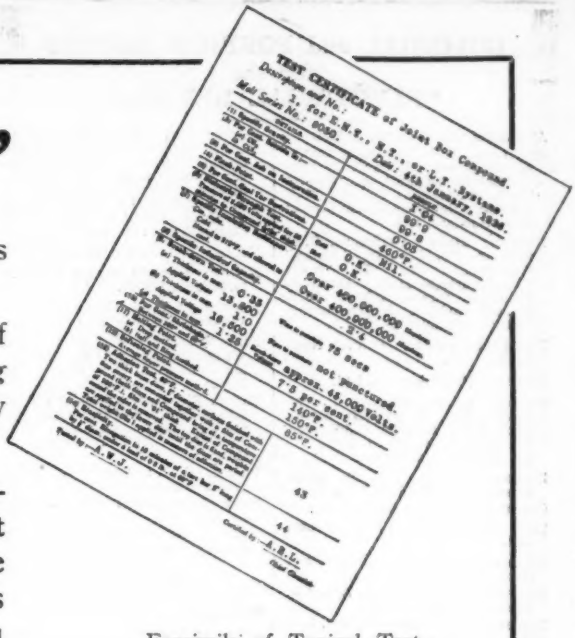
SC
K 25

"No News . . . ."

It is a common saying that "No news is good news."

But that does not apply in the case of purchases of Joint Box and Sleeve Filling Compounds in which you should be fully posted in all particulars.

If YOU use these and similar compounds, *demand* a copy of the tests that have been made on your supplies to ensure you are receiving none but high-class material. There is no reason why you should not have a copy if proper tests really are being made: otherwise, "no news" may not necessarily mean "good news."


TEST CERTIFICATE of Joint Box Compound.

Facsimile of Typical Test Certificate sent to the customer with every delivery of *Berry-Wiggins* Joint Box :: or Sleeve Compounds. ::

BERRY, WIGGINS and COMPANY, Ltd.,
SPECIALISTS IN COMPOUNDS,
STRATFORD, MARKET, LONDON, E. 15.

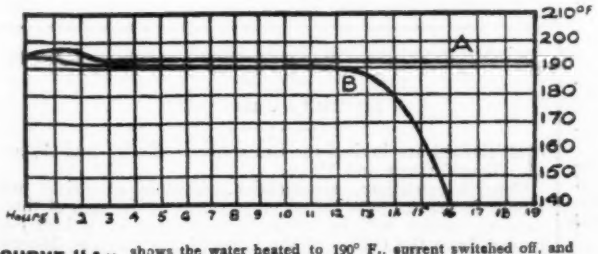
Telephones: Maryland 3261 (3 lines). Telegrams: "Berriggins, Strat, London."

A full supply of HOT WATER instantly available with

Designed in all capacities from 4½ to 450 galls. over 10,000 *'Cumulus'* Heaters have been installed

CUMULUS
THERMAL STORAGE TYPE
ELECTRIC WATERHEATERS
FOR ALL PURPOSES

Here is convincing proof of the efficiency of the "Cumulus Water Heater."



CURVE "A" shows the water heated to 190° F., current switched off, and no water withdrawn during the test. The water temperature rises to 197.2° F., at the end of the first hour, owing to heat stored in the heater passing to the water; 19 hours after switching off the temperature is still 192° F. —a fall in temperature of only 4° F. in 19 hours. This proves the remarkable efficiency of the heat insulation.

CURVE "B" is a curve approximating to working conditions. Current off throughout the test and an initial water temperature of 196° F. One-sixteenth of the full capacity (13½ gallons) is withdrawn every hour for 16 hours and an equal quantity of cold water at 52° F. admitted. At the end of the 13th hour the temperature of the water delivered is 187° F., or 9° F., below the initial water temperature; even at the end of the sixteenth hour, after current has been shut off, the temperature of the last drop of water originally heated is 142° F.

May we send you further details?

NATHAN & ALLEN, 25, Victoria Street, LONDON, S.W.1

COLONIAL and FOREIGN AGENTS for the "ELECTRICAL REVIEW."

ADELAIDE: H. A. Goddard, Ltd.

AUCKLAND, N.Z.: Gordon & Gotch, Albert Street; R. Hill & Son, Matlock House, 33/34, Quay Street; Trade Publications Co., 302, N.Z. Insurance Buildings, Queen Street; H. A. Goddard, Ltd.

BERLIN: Hubert Hermanns, Friedrichstr. 218. S.W.48; "Kniga" Kurfurste str. 79. W.62; Uberseeverlagsanstalt. G.m.b.H. Leipziger Strasse 101/102. W. 8. Hirschwaldsche Buchhandlung, Unter den Linden 68. N.W.7.

BLOEMFONTEIN: Central News Agency, Ltd.

BOMBAY: Thacker & Co., Ltd.

BOSTON, MASS., U.S.A. F. W. Faxon Co., 83, Francis Street, Back Bay; Herman Goldberger, 110, High Street; W. H. Guild and Co. 120, Tremont Street.

BRISBANE: Gordon & Gotch, Queen Street; H. A. Goddard, Ltd.

CALCUTTA: Thacker, Spink & Co.

CAPE TOWN: Central News Agency, Ltd.

CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.

DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.

DURBAN: Central News Agency, Ltd.

FREMANTLE, W.A.: H. A. Goddard, Ltd.

GOETTINGEN (Germany): A. R. Pillai & Co.

HELSINGFORS (Finland): Akademiska Bokhandeln.

JOHANNESBURG: Central News Agency, Ltd.

LAUNCESTON: Gordon & Gotch, Cimitiere Street; H. A. Goddard, Ltd.

LEIPZIG: Einkaufstelle des Borsenvereins der Deutschen Buchhandler, Konigstrasse 35.

MADRAS: Higginbothams, Ltd.

MADRID: Editorial "Voluntad" S.A. Serrano 48.

MELBOURNE: Tait Book Co., 39, Queen Street; Gordon & Gotch, Queen Street; "Australasian Electrical Times," 312, Flinders Street; Commonwealth Magazine Agency, 294, Little Collins Street; G. Jervis Manton, 480. Little Collins Street; H. A. Goddard, Ltd.

MILAN: Libreria Paravia-Treves.

NANCY: Librarie Berger Levrault. 18, Rue des Glacis.

NAPLES: Libreria Paravia-Treves. Via Guglielmo Sanfelice 49-55.

NEW YORK: D. Van Nostrand, 8, Warren Street; Crowley, The Magazine Man, Inc., 511, E.164th Street.

PARIS: Ricour, Chevillet et Cie 22, Rue de la Banque; E. Le Francois. 91, Boulevard St. Germain; H. Le Soudier, 174/176, Boulevard St. Germain.

PERTH, W.A.: Gordon & Gotch, William Street.

PORT ELIZABETH: Central News Agency Ltd.

PRAGUE (Czechoslovakia): Fr. Rivnac, Librarie Na Prikope 24; F. Topic.

ROME: Ditta P. Maglioni & C. Strini, 88, Via Due Macelli.

SIMLA: Thacker, Spink & Co.

SYDNEY: Tait Book Co., 273, George Street; Gordon & Gotch, Pitt St.; Commonwealth Magazine Agency, 183, Pitt Street; H. A. Goddard, Ltd., 255a, George Street.

STOCKHOLM: Allmanna Tidningskontoret, Gustav Adolfs Torg; C. E. Fritze, Fredsgatan, 2.

TOKYO: Maruzen Co., Ltd., 11-16, Nihonbashi-Tori-Sanchome.

TORONTO, ONT.: Wm. Dawson and Sons, Ltd., Manning Chambers; Gordon & Gotch, 132, Bay Street.

WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

ZURICH: E. Rascher & Cie, Rathausquai 20.

Illustrations!

BLOCKS intended for use in the advertisement pages of the "Electrical Review" should not exceed 120 Screen.

OFFICIAL NOTICES.

Latest time for receiving, 5 p.m. Tuesday.

CENTRAL ELECTRICITY BOARD.

South-East England Electricity Scheme, 1927.

THE Central Electricity Board invite Tenders for the supply, delivery and erection of a 33,000-volt Overhead Transmission Line between Brighton and Worthing.

Copies of the Specification No. S.E.E.—S.L.1 and form of tender may be obtained from the offices of the Board on application to the undersigned on or after Monday, July 2nd, 1928, on payment of a deposit of two guineas for the first copy and one guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona-fide* tender.

Tenders on the form supplied endorsed "Tender for Specification, No. S.E.E.—S.L.1," must be delivered to the offices of the Board not later than 12 o'clock noon on Friday, July 27th, 1928. The Board do not bind themselves to accept the lowest or any tender.

J. R. BROOKE,
Secretary.

Trafalgar Buildings,
Charing Cross, W.C.2. 2730

BOROUGH OF HARROGATE.

TENDERS are invited for the supply, delivery and erection of two 50,000-lb. Boilers, complete with pipe work and accessories.

Specification and form of tender may be obtained from the undersigned, and must be returned not later than July 17th, 1928, endorsed "Boiler Plant."

N. McLEAN, A.M.I.E.E.,
Borough Electrical Engineer.

33, Swan Road, Harrogate. 2738

OFFICIAL NOTICES.—*Continued.*

NEWRY URBAN DISTRICT COUNCIL.

Newry Electricity Special Order, 1928.

TENDERS FOR PLANT.

THE above Council invite Tenders for the supply, delivery, and erection at Newry, Northern Ireland, of the following Plant:—

Contract No. 2.—Two (approx.) 100 b.h.p., and one (approx.) 150 b.h.p. Heavy Oil Engines, each direct coupled to a L.T. 3-phase Alternator.
Contract No. 3.—Low Tension Switchboard for 3-phase, 4-wire System.
Contract No. 4.—5 Ton Travelling Overhead Crane.
Contract No. 5.—Underground and Overhead Distributing Mains and Services, and Street Lighting Installation.

All in accordance with specifications and plans, &c., prepared by Mr. P. A. Spalding, A.M.Inst.C.E., A.M.I.E.E., Consulting Engineer to the Council, and the General Conditions applying to the contracts.

Copies of each specification, plan, general conditions, and form of tender may be obtained from the undersigned on payment of two guineas per copy, which sum will be refunded on receipt of a *bona-fide* tender.

No tender will be considered unless on the official form.

The above Council shall have the right to accept any tender provisionally subject to their obtaining the necessary sanction to the raising of a loan to defray the cost of the entire scheme and to their being able to negotiate same on acceptable terms and conditions. No tender shall be retracted or withdrawn during two calendar months from the date on which it is delivered, and each tender shall remain binding upon the contractor and may be accepted at any time by the said Council during that period.

Tenders, under sealed cover, must be delivered at the office of the undersigned not later than Saturday, the 21st day of July, 1928, and endorsed "Tender for ———."

The Council do not bind themselves to accept the lowest or any tender.

Dated this 23rd day of June, 1928.

W. M. CRONIN, Town Clerk.

Town Hall, Newry. 2702

LONDON AND HOME COUNTIES JOINT ELECTRICITY AUTHORITY.

Transmission Lines.

THE London and Home Counties Joint Electricity Authority invites Tenders for the manufacture, delivery, laying, jointing, testing and putting into operation of a transmission line consisting of duplicate extra high tension and telephone cables from the generating station of the Kingston-upon-Thames Borough Council to the Hersham sub-station of the Walton-upon-Thames Urban District Council.

Copies of the specification No. W.M.1, general conditions and form of tender may be obtained from the offices of the Authority on application to the undersigned on payment of a deposit of two guineas. This deposit will be refunded provided that a *bona-fide* tender has been sent in and not withdrawn. Extra copies may be obtained on payment of a sum of one guinea each, which sum will not be returnable.

Sealed tenders on the form supplied, endorsed with the name and address of the firm tendering and marked "Tender for Transmission Lines," must be delivered to the offices of the Authority not later than twelve o'clock noon on Thursday, the 12th July, 1928.

The Authority does not bind itself to accept the lowest or any tender.

LESLIE GORDON,
Clerk to the Authority.

5, Millbank, Westminster, S.W.1.
June 18th, 1928. 2628

SHOEBURYNESS URBAN DISTRICT COUNCIL.

Electricity Undertaking.

TENDERS are invited for Underground Mains, Switchgear, Transformers and Meters.

General conditions, specification, schedule of prices and tender forms can be obtained on payment of the sum of three guineas (which will be returned on receipt of a *bona-fide* tender) from the Offices of the Consulting Engineers, Messrs. A. Hugh Seabrook & Partners, 146, Bishopsgate, London, E.C.2.

Sealed tenders, endorsed "Tender for Electricity Plant," to be addressed to Frederic Gregson, Esq., M.A., Clerk to the Shoeburyness Urban District Council, 46, Alexandra Street, Southend-on-Sea, Essex, and to be received not later than mid-day Monday, July 16th, 1928.

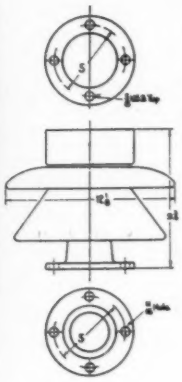
The Council do not bind themselves to accept the lowest or any tender.

FREDERIC GREGSON, M.A.
Clerk to the Shoeburyness Urban District Council.

46, Alexandra Street,
Southend-on-Sea, Essex. 2670

(Continued on Sup. 30.)

POST INSULATOR



Number of Units	Line Voltage
2	66000
3	99000
4	132000
5	165000
6	195000
7	220000

Insulator No. 4285

Code Word YAYAP

CANADIAN PORCELAIN COMPANY Limited

HAMILTON—ONTARIO—CANADA

(Series No. 70) Cable address "PORCELAIN" Hamilton-Ontario

CANADIAN PORCELAIN Co. (BRITISH), LD.

:: :: 343, ABBEY HOUSE, :: ::

4, VICTORIA STREET, LONDON, S.W.1

Telegraphic Address: "Canaporcel, Sowest, London."

'Phone: Central 4703. 'Grams: "Seejasir," Fleet, London.

Established 1879.

THE

CONTRACT JOURNAL

THE PAPER DEALING WITH ALL WORKS PROJECTED & IN HAND.

CONTRACTS OPEN, RESULT OF TENDERS, BUSINESS NOTES, &c.

Send for copy, 9d. Annual Subscription 39/-.

Advertisement Rates on application to—

MR. W. L. PITMAN,
124, Temple Chambers,
Temple Avenue,
LONDON, E.C.4.

Price 1s. Post Free 1s. 2d. Demy 4to. Paper Cover.

Localising High-Resistance Breaks in Cables.

By J. RYMER-JONES.

THE ELECTRICAL REVIEW, Ltd., 4, Ludgate Hill, London, E.C.4.

COMMUTATOR GRINDERS

JOHN PHILLIPS & CO., 166, WALWORTH RD., LONDON. S.E.17.

THE PRACTICE OF ELECTRICAL WIRING.

By DONALD SMEATON MUNRO, M.I.E.E., M.Assoc. Mining E.E.

267 Pages. 100 Illustrations. 5/- net, or by post 5/4.

THE ELECTRICAL REVIEW, LTD., 4, LUDGATE HILL, LONDON, E.C.4.

FOR THE BEST RESULTS——— ADVERTISE YOUR "WANTS" IN

THE ELECTRICAL REVIEW

Small Classified Advertisement Columns.

RATES and ORDER FORM.

"Situations Vacant" and "Wanted"
If prepaid ... ... 1d. per word.
3 insertions for the price of 2.

"For Sale," "Articles Wanted," "Agencies," "Businesses for Sale & Wanted" and "Miscellaneous." 1/9 per line or 14/- per inch.

Auction Notices and Educational Notices, 14/- per inch.
8 words to a line. 8 lines to an inch. NO REDUCTION FOR A SERIES.

Box Number counts as 7 words. 6d. extra charged for postage on replies.

To THE ELECTRICAL REVIEW, LTD., 4, Ludgate Hill, London, E.C.4.

Please insert the above advertisement for.....weeks, under.....for which I enclose remittance value £ . :
to cover cost.

Cheques and Postal Orders, made payable to THE ELECTRICAL REVIEW, LTD., must accompany PREPAID Advertisements.

Name.....

Address.....

Latest Time for Receiving "Smalls" TUESDAY, 5 o'clock.

OFFICIAL NOTICES.—(*Con. from Sup. 28*)

ELECTRICITY (SUPPLY) ACT, 1926.

North-West England and North Wales Electricity Scheme, 1928.

WHEREAS the Electricity Commissioners have prepared and transmitted to the Central Electricity Board a scheme bearing the above short title and relating specifically to—

The Administrative Counties of Anglesey, Carnarvon, Cumberland, Denbigh, Flint, Lancaster, Merioneth, Montgomery, and Westmorland;

Parts of the Administrative Counties of Cardigan, Chester, Derby, Salop, and West Riding of York;

The City and County of the City of Chester; and

The County Boroughs of Barrow-in-Furness, Birkenhead, Blackburn, Blackpool, Bolton, Bootle, Burnley, Bury, Carlisle, Liverpool, Manchester, Oldham, Preston, Rochdale, St. Helens, Salford, Southport, Stockport, Wallasey, Warrington, and Wigan;

and dealing with the matters mentioned in Section 4 (1) of the Electricity (Supply) Act, 1926.

Notice is hereby given that the Central Electricity Board have caused the said scheme to be published, and that any authorised undertakers or other persons interested in the said scheme and desiring to make representations thereon may do so by forwarding the same by registered letter addressed to the undersigned and posted not later than the 27th day of July, 1928. Copies of the said scheme and of a volume of particulars supplementary thereto may be obtained at the prices of one shilling and sixpence and three shillings and sixpence each, respectively, from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, and 120, George Street, Edinburgh.

Dated this 22nd day of June, 1928.

J. R. BROOKE,
Secretary to the Central Electricity Board

Trafalgar Buildings,
1, Charing Cross,
London, W.C.2. 2668

LLANDILO URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for the supply (subject to the consent of the Electricity Commissioners being obtained) of:—

(i) One 75-kW Crude Oil Electricity Generating Set complete, including starting, cooling and fuel accessories, testing and erection.

(ii) One 10-ton Oil Storage Tank erected, including pump, &c.

(iii) One Control Panel, including connecting cable to generator and to existing switchboard.

Any further information may be obtained from the Engineer (Mr. T. Bowen), Electricity Station, Llandilo.

Sealed tenders, marked "Tender for Generating Set," must be delivered to the undersigned not later than the 14th July, 1928.

The Council do not bind themselves to accept the lowest or any tender.

HUGH WILLIAMS,
Clerk to the Council.

2, Bank Buildings,
Llandilo,
21st June, 1928. 2676

BOROUGH OF STOCKTON-ON-TEES.

Electricity Department.

THE Corporation invite Tenders for the supply of Paper Insulated Cables.

Specifications and forms of tender may be obtained from S. G. Marston, General Manager and Engineer, Electricity Works, Thompson Street, Stockton-on-Tees.

Tenders to be addressed to the undersigned, Borough Hall, Stockton-on-Tees, not later than July 9th, 1928.

The Corporation do not undertake to accept the lowest or any tender.

THOS. DOWNEY,
Town Clerk.

Borough Hall,
Stockton-on-Tees,
21st June, 1928. 2681

NOTICES RELATING TO PATENTS.

Advertisements are inserted under this heading at 14s. per inch.

ACCESSORIES.—For the sale outright of Patent No. 270,530 for a combined ceiling plate, ceiling rose and wood block made in porcelain, bakelite and colours, protected in Great Britain and various countries. The article is eminently suitable for all house lighting schemes.—2612, Electrical Review, 4, Ludgate Hill, London.

EDUCATIONAL NOTICES.

Advertisements are inserted under this heading at 14s. per inch.

INTERNATIONAL CORRESPONDENCE SCHOOLS.

School of Electrical Engineering.

THIS Institution—the largest in the world devoted to spare-time training—has complete Courses of Instruction to cover the

Associate Membership Exam., I.E.E.,
and the
Limited Competition for Probationary Asst. Eng., G.P.O.

Other Courses meet the requirements of all who desire a thoroughly practical and profitable technical education, and all who wish to qualify for positions in the Design Office, Test Room or Drawing Office, or as Chief Engineers, Assistant Engineers, Shift Engineers, or Switchboard Attendants in Electric Power, Light and Traction Stations. Equally successful is our instruction for Telegraph and Telephone Engineers, Telegraphists, and Telephonists.

All instruction is by correspondence from text-books specially prepared by many experts for tuition by post.

Prospectus post free from

INTERNATIONAL CORRESPONDENCE SCHOOLS, LTD.,
55, International Buildings, Kingsway, London, W.C.2.
874

MANCHESTER MUNICIPAL COLLEGE OF TECHNOLOGY.

Principal: B. MOUAT JONES, D.S.O., M.A.(Oxon.).

UNIVERSITY OF MANCHESTER
(Faculty of Technology).

DEGREE COURSES IN TECHNOLOGY.

THE Prospectus gives particulars of the courses leading to the Manchester University Degrees (B.Sc.Tech., M.Sc.Tech., and Ph.D.) and Certificates in the Faculty of Technology, in the following Departments:—

MECHANICAL ENGINEERING
(Prof. Dempster Smith, M.B.E., M.Sc.Tech., M.I.M.E.).

ELECTRICAL ENGINEERING
(Prof. Miles Walker, M.A., D.Sc., M.I.E.E.).

MUNICIPAL AND SANITARY ENGINEERING
(G. S. Coleman, D.Sc.Eng., A.M.Inst.C.E., A.M.Inst.M. and Cy.E., F.R.San.I.).

APPLIED CHEMISTRY, including General Chemical Technology, Chemistry of Textiles (Bleaching, Dyeing, Printing and Finishing), Paper Manufacture, Metallurgy and Assaying, Chemical Technology of Brewing, Electro-Chemistry, Photography, Colouring Matters, Foodstuffs and Fuels)
(Prof. James Kenner, D.Sc., Ph.D., F.R.S.).

TEXTILE TECHNOLOGY
(Prof. W. E. Morton, M.Sc.Tech.).

INDUSTRIAL ADMINISTRATION (Post-Graduate Course)
(J. A. Bowie, M.A., D.Litt.).

Prospectus will be forwarded free on application to the Registrar, College of Technology, Manchester. 2673

BINDINGS AND CASES.—Subscribers of the ELECTRICAL REVIEW and others can have their half-yearly numbers bound handsomely in Black Cloth at the rate of 7/- per Volume, including Index. Cases for binding are also supplied at 4/6 each post free 5/-. Indices gratis on application.

HOOPER'S

Telegraph & India-Rubber Works, Ld.

Adelaide House, 5, Lower Ground Floor, King William Street, E.C.4. *(Established 1860.)*

MILLWALL DOCKS, LONDON, E.14.

PURE TAPE AND STRIP, &c., &c.

HOOPER'S Vulcanised India-Rubber Cables for Electrical Work maintain the highest quality, and their durability has been proved.

Telegrams: LINEAR, London. Telephone: Royal 4139.

F. WIGGINS & SONS.

MICA FOR INSULATION.

Telephone: Royal 8029

Largest Stock in the World.

102, 103 & 104, Minories, LONDON, E.C.

ABOVE THE FAMOUS TRICITY RESTAURANT IN THE STRAND
is The Tricity IDEAL (ELECTRIC) HOME

Where Engineer, Contractor and Consumer meet.

Are you using these Wonderful Showrooms as your own and reaping the profit our Publicity brings?

For Grilling, Toasting, Boiling. This Breakfast Cooker has a splendid Market. Always ready for use. Its usefulness and economical value makes it a ready seller where kitchen space is limited.

Control by 3 heat-switch.
Weight - - 26 lbs.
Loading - 1600 watts.

No. 718 Breakfast Cooker

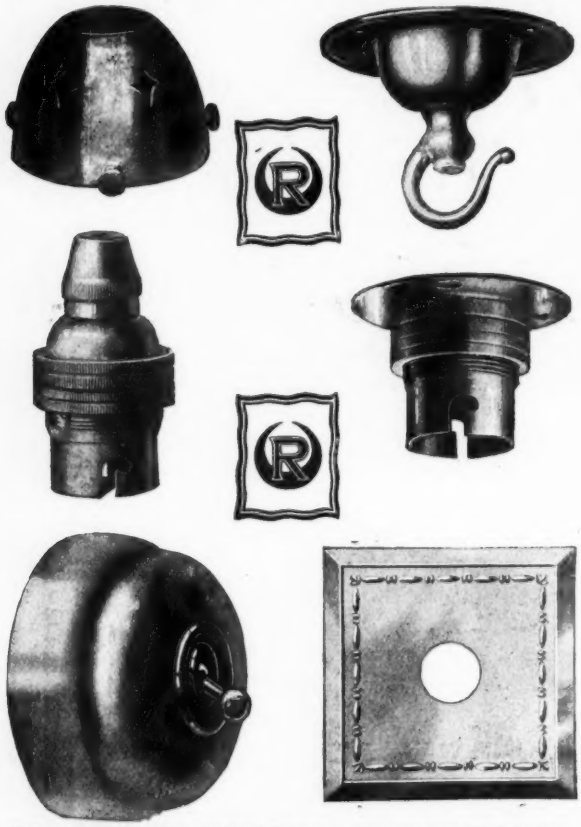
£2 - 17 - 6

Write :

WELLINGTON HOUSE, 125-130, STRAND, W.C.2

For Catalogue (64 pages) and full particulars.

REEVES & CO.



CRESCENT WORKS, BIRMINGHAM.

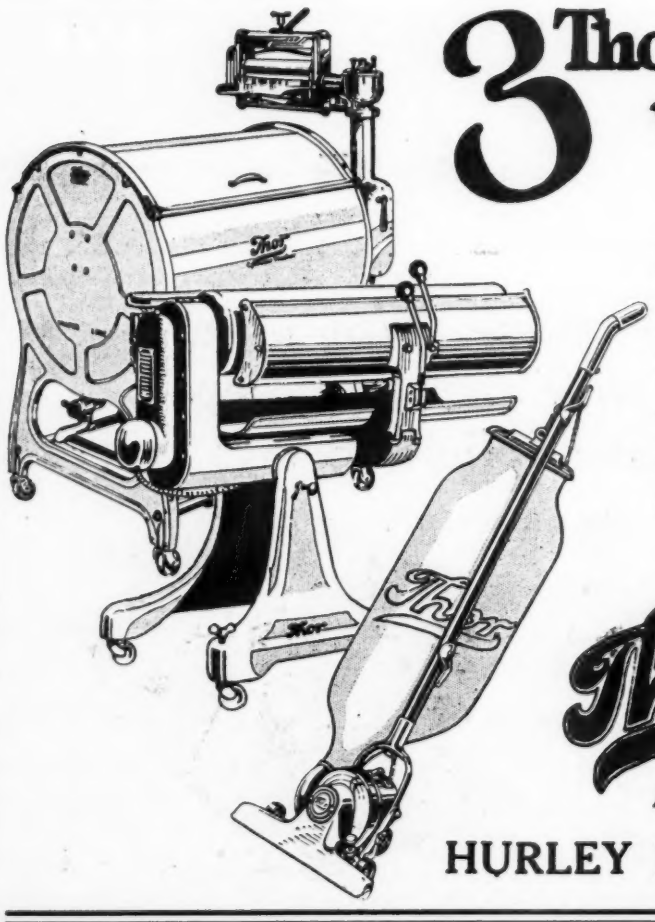
L. & C. HARDTMUTH
KOH
-I-
NOOR

Made in 17 degrees 6 B. to 9 H. Obtainable from Drawing Material Dealers, Stationers, &c.

Each degree remains the same now as when first made many years ago, and the lead in every pencil is uniform throughout.

Each 4d., ***dozen*** 3/9, ***6 dozen*** 21/-, ***1 gross*** 40/-.

L. & C. HARDTMUTH,
29, Kingsway, London, W.C.2.



3 Thor lines which it will pay you to sell

Hardware retailers naturally desire to carry those lines which yield the greatest margin of profit. If you sell Thor products you are assured of a handsome profit, thus materially reducing your overhead charges. Thor Electric Washers, Ironers and Vacuum Cleaners are easy to sell, for they need no expert salesmanship or technical demonstrators.

These popular easy selling appliances are supported with National advertising, the Thor guarantee, the Thor demonstration and Thor sales assistance.

Write to-day for further information.

Thor

Electric
Washers & Wringers,
Automatic Ironers & Vacuum Cleaners.

HURLEY MACHINE Co., 245, Oxford Street, LONDON, W.1

OVERHEAD EQUIPMENT

for Electric Tramways and Light Railways

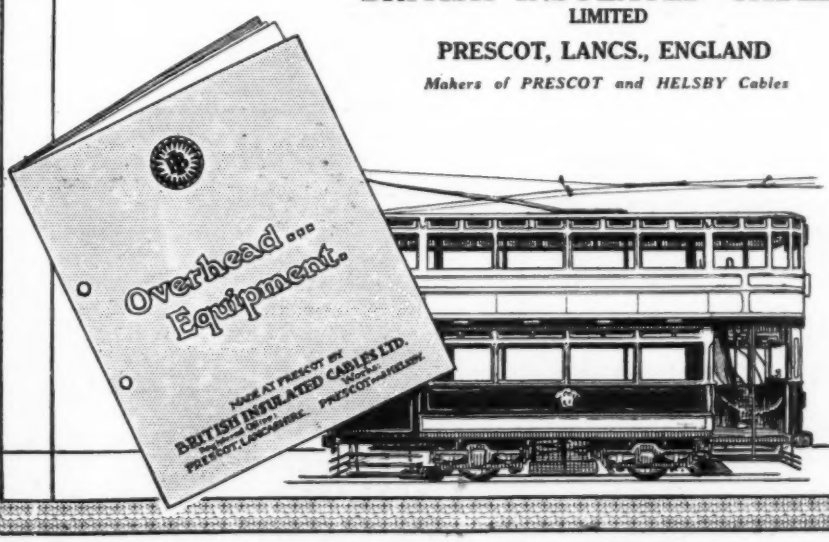
Of late years there has been a growing tendency to make use of the well-known insulating properties of porcelain for the purpose of insulating overhead contact or trolley wires.

We have been completely successful in designing and producing a range of fittings which will give an All Porcelain Insulated Line.

Careful attention has been paid to the necessity for simplicity and ease in erection or replacement.

For further particulars ask for catalogue P.219.

BRITISH INSULATED CABLES
LIMITED
PRESCOT, LANCS., ENGLAND
Makers of PRESCOT and HELSBY Cables



ELECTRIC CRANES, CAPSTANS, WINCHES, Etc.

ROYCE LTD.

STEEL FRAME BUILDINGS.

Trafford Park, MANCHESTER.

DYNAMOS, MOTORS, & CONTROL GEAR.

CASH BUYERS SCRAP IRON, STEEL, ALSO TURNINGS, BORINGS, &c.

A. WEBSTER, LIMITED,
Victoria Road,
WILLESDEN JUNCTION, N.W.10.
Sidings :— PARK ROYAL G.W.Ry
Telephone :— WILLESDEN 4741-2.

CASH BUYERS SCRAP COPPER, BRASS, GUN-METAL, Also Borings, RESIDUES, &c.

RIGHT AT THE FRONT.
The "ADAPTABLE" Earthing and Bonding Clip
Absolutely the only clip on the market that will fit any size Conduit, Cable, or Pipe.
Tel. : 5635 C

HANN & INGLE, 13, Albert Place, Bridge Street, Manchester. (Or your Supplier.)

POMONA RUBBER CO.,
MEDLOCK WORKS, LONDON ROAD, MANCHESTER,
For RUBBER TAPES.

BRITTAIN'S ELECTRIC MOTOR CO.
(Formerly LANGDON-DAVIES Electric Motor Co.)
Head Office & Works : DERMODY ROAD, LEWISHAM, S.E. 13.
'Phone : Lee Green 1473. Telegrams : "Damophon Lewis, London."
MANUFACTURERS OF A.C. MOTORS AND GENERATORS.

HEAVY COPPER EARTHING CLIPS
OUR MARK ("F. R. B'ham.") is YOUR GUARANTEE—look for it.
ALL SIZES UP TO 15"
F. RYMAN, 116, Livery Street, BIRMINGHAM.

SLATE & MARBLE PANELS
ASHFORD, DUNN & CO., LTD.,
RYDE AVENUE, HULL.
Telegs. : "Mantel, Hull." Telep. : 7577 Central.
Manufacturers of every description of Slate and Marble Work for Electrical Purposes.

The ARORA ELECTRIC Fires & Cookers FOR QUICK SALES
THE ARORA CO LOUGHBOROUGH, LEICS.

VACUUM IMPREGNATING PLANT
A M E I
AUTOMATIC ARMATURE WINDING MACHINES,
COIL WINDING MACHINES,
TRANSFORMER DEHYDRATING EQUIPMENT
(VACUUM AND CENTRIFUGAL),
CORE PLATE VARNISHING MACHINES.
SOC. ANON. M.A.X.E.I., 66, Victoria Street, LONDON.

Sell us your Battery plates & Peroxide— prompt settlement
Capper Pass & Son Ltd
BEDMINSTER SMELTING WORKS BRISTOL
TELEPHONE : BRISTOL 8080 (3 Lines) TELEGRAMS : "PASS BRISTOL"

IF YOU REQUIRE A NAIL THAT WILL NOT BECOME LOOSE,

THE NAIL BENT AFTER PLACED IN POSITION
the Heads Come Off in Driving, or Shanks Break —
IT MUST BE SNOW'S.
Used largely by Electricians, Railway Companies, and for Telephone and Wireless Installation.
Write for Samples and prices to :—

1", 1¼", 1½", 2", 2½", 3".
247, SHAKESPEARE ROAD, S.E.24.

Complete Set with full instructions. Price 7/6
The Lamp alone, 2/6
ANOTHER USE FOR
FLUXITE
the paste flux that SIMPLIFIES SOLDERING.

FIBRE
(GENUINE AMERICAN.)
SHEETS, RODS, TUBES, BUSHES, DISCS, WASHERS.
SEND YOUR ENQUIRIES FOR ABOVE TO
AUSTIN & HAYES, WOODSIDE WORKS HIGHGATE, LONDON, N
"Austayes, Higate, London." Telephone : Mountview 1476

HARDENING TOOLS AND CASE-HARDENING
A beautiful bright glass-hard surface without scale.
Ask for Leaflet on Improved Methods.
Of all Ironmongers in tins, 8d., 1/4 and 2/8.
FLUXITE, LTD., (Dept. 54), West Lane Works, West Lane, ROTHERHITHE, S.E. 16.

WE WANT YOU
To know THAT we Manufacture
GLASS — Fuse Tubes to any limit down to '005" at a price that helps to secure business.
GLASS — Scientific Apparatus from a Test Tube to a Gas Analysis Outfit.
GLASS — Funnels and Thread Guides.
GLASS — for Surgical, Drug & Electrical.
FOR ARTSILK TRADES.
Why not get to know us?
THE GLASS HOUSE,
47a, Reginald Road, Forest Gate, LONDON, E.7.
Maryland 3769.

VINCULUM CONCRETE CABLE COVERS JOINT BOXES INDICATOR POSTS

SOLE MANUFACTURERS:

TARMAC LTD., VINCULUM DEPT.

For electrical Work enquiries to:
G. BARNARD, A.M.I.E.E., M.I.M.
1, NILE ST., BIRMINGHAM.

ETTINGSHALL, WOLVERHAMPTON.

Safe on electrical FIRES

THE well-known Pyrene Fire Extinguisher — over 4,500,000 have been supplied already—is safe to use at all times on electrical fires because the Pyrene Fire Extinguisher liquid contained is a non-conductor of electricity. It instantly breaks an electric arc no matter how high the voltage. Works like a pump and does not have to depend on maintained pressure. Can be used in any position and at any angle.

Write for descriptive pamphlet "Extinguishing Electrical Fires Safely."

Pyrene TRADE MARK FIRE EXTINGUISHER

THE PYRENE COMPANY, Ltd.,
9, Grosvenor Gdns., London, S.W.1.
Telephone: Victoria 8302. Telegrams: "Pyrenextin, Sowest, London."

—ELECTRICAL INSULATION—

MICA Plates, Segments, Splittings supplied in cut form or in original Cases.

MICANITE,
BAKELITE,
EBONITE,
CLEMATITE (Arc proof material),
VULCANISED FIBRE,
ELECTRICAL MOULDINGS.

DACIER LTD.

(Head Offices) 15/16, Jewry Street, LONDON, E.C.3.
WORKS: 8, 10 & 12, Wagner St S.E. 15.
Telephone: ROYAL 7652, 3 & 4 (3 lines).

BEHIND THE COMMUTATOR

COMMUTATORS FOR ALL TYPES OF ELECTRIC MOTORS & GENERATORS
NEW OR RE-BUILT ON EXISTING SLEEVES
SKILFUL REPAIRS

OVER 200 TYPES IN STOCK FOR CAR LIGHTING & STARTING

ELECTRIC CLOCKS

Over **800** supplied for the new **London County Hall.** Other contracts include installations for Hospitals and Institutions ALL OVER THE WORLD.

NO WINDING. ACCURATE TIMEKEEPING.

GILLETT & JOHNSTON,

(THE CROYDON BELL FOUNDRY, LTD.)

CROYDON, SURREY. (Est. 1844.

London Agents:—
A. LYON & CO., 82, Fenchurch St., London, E.C.3
Telephone - - Royal 1177-1178.

Phone WEMBLEY 0147

DIMMERS RESISTANCES SWITCHBOARDS

MICKELWRIGHT LTD
ALPERTON WORKS
WEMBLEY

HIGH TENSION & LOW TENSION INSULATORS

THE EQUIPMENT & ENGINEERING CO. 2&3 NORFOLK STREET, STRAND, LONDON W.C.2

Plain Sailing

Many an awkward job becomes perfectly plain sailing if you consult S. & S. M. No moulding however intricate is too difficult to be successfully handled by our skilled engineers—at the present moment we have under construction at our Works, Bakelite mouldings with as many as fifty metal inserts.

The best powder obtainable is invariably used, and the perfect insulating properties of S. & S. M. Bakelite mouldings are not affected by electrical, mechanical, or temperature stresses. S. & S. M. Bakelite mouldings have an exceptional degree of strength both in tension, compression and shear, and are not injured by water, oil or acid.

Only years of careful work in research and construction have achieved this. S. & S. M. Bakelite mouldings possess all the properties essential to perfect insulation—they are made in all colours which are retained indefinitely, and for finish and reliability they are unsurpassed.

Write for Illustrated Leaflet.

S&SM
THE MARK OF RELIABILITY

SOLIDITE & SYNTHETIC MOULDINGS, LTD.,
Albion Works, North Street, Clapham,
LONDON, S.W.4.
Telephone—Telegrams: - - - Battersea 5592-3.

METAL-PORCELAIN CEMENT

Axe Brand.

The only Efficient Substitute for Glycerine and Litharge.

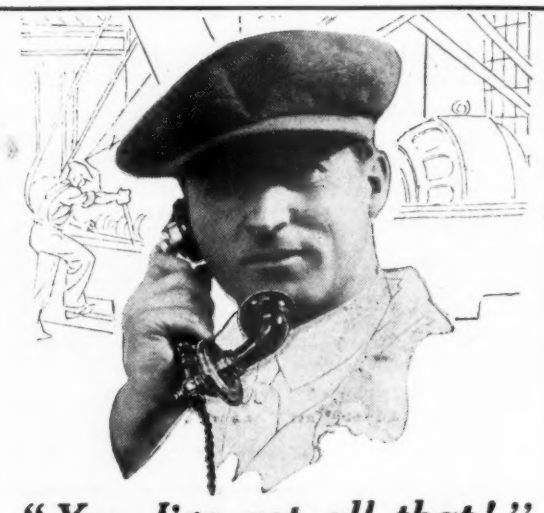
Quicksetting.
Waterproof.
Weatherproof.
Acidproof.
Oilproof.
Heatproof up to 150° C.
Non-Shrinking.
Non-expanding.
Non-toxic.
Insulating.
Easy to handle.
No complications.

PRICE and PARTICULARS on application.

Stocks kept in London and Manchester.

Write for Particulars to

FUERST BROTHERS & COMPANY, Ltd.
17, PHILPOT LANE, LONDON, E.C.3.
Telegrams: "Fuerst, London." Telephone: Royal 6911.



"Yes, I've got all that!"

THE crash and clangour of busy workshops prove a good test for the clarity of the Ericsson Intercommunication Telephone System. Clear speaking, sturdy, foolproof—always on the job—free from breakdown.

No concern can be fully equipped unless it incorporates an Ericsson System.

Used by large corporations all over the world, leading Shipping Lines, Railway Companies, Colonial Governments, etc.

We make Automatic Exchanges large and small.

Write to-day for literature and quotations.

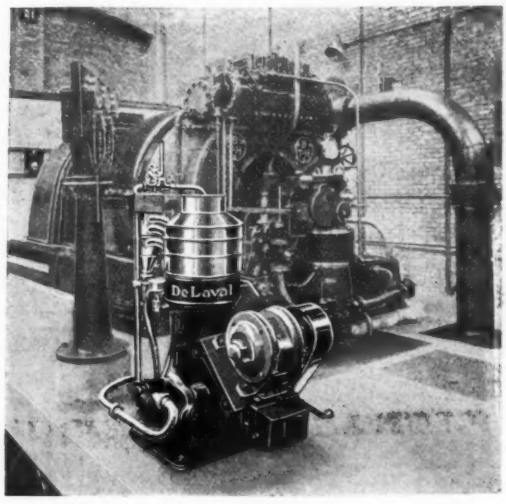
Ericsson

Ericsson Telephones, Ltd.
67/73, Kingsway, London, W.C.2

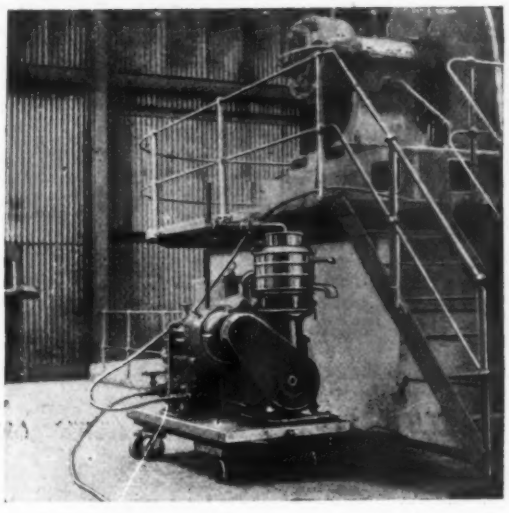
INTERCOMMUNICATION
TELEPHONES

DE LAVAL

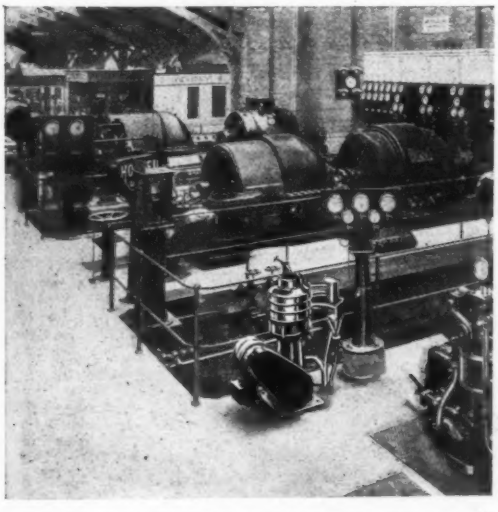
CONTINUOUS BYE-PASS SYSTEM
OF
TURBINE OIL PURIFICATION.



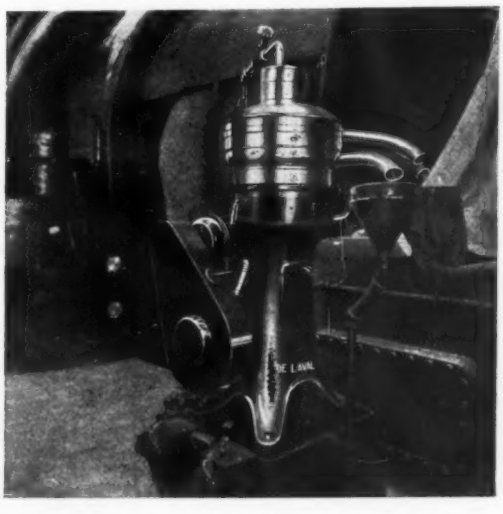
A typical De Laval Turbine Oil Purifying Plant.



A De Laval Purifying Turbine Oil at Croydon Power Station.



A 300 galls. per hour De Laval Purifying Turbine Oil.



A De Laval in use on the continuous system of Turbine Oil Purification.

Throughout the world, in all modern steam turbine installations, the DE LAVAL CONTINUOUS BYE-PASS SYSTEM is fitted as the STANDARD method for the purification of the oil in the Turbine.

The De Laval method is recommended by both Turbine Builders and Turbine Users.

Write for copy of new Publication.

ALFA-LAVAL COMPANY LIMITED,

34, Grosvenor Road, LONDON, S.W.1.

Electrical Appliances are the vogue

Sell XCEL ALL BRITISH

ELECTRIC DOMESTIC APPLIANCES

These appliances find a ready sale throughout the year.

They are a necessity in every electric home and their recommendation and sale will give satisfaction both to the retailer and consumer.

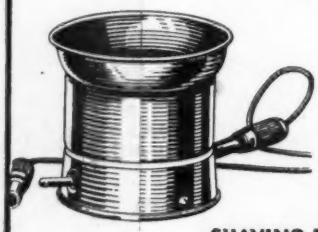
The examples illustrated are a selection which are priced within the means of a modest purse.

SIEMENS DISTRIBUTORS OF XCEL

MANUFACTURERS OF XCEL

"FULRAY" BOWL FIRE FROM 27/6

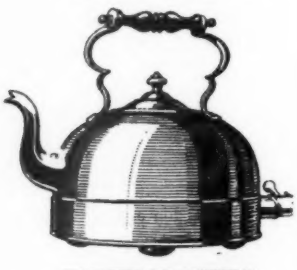
A RELIABLE TOASTER PRICE 25/-



SHAVING POT IN SOLID COPPER 17/6

No 1 IRON PRICE 17/6 ELEMENT GUARANTEED FOR ALL TIME

TOURIST IRON WITH FOLDING HANDLE INVALUABLE TO TRAVELLERS 25/-



ELECTRIC KETTLE FINISHED IN POLISHED COPPER ---- 27/6

Adut of SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED. 38/9 Upper Thames Street, London, E.C.4

Branches at – Belfast. Birmingham. Bristo . Cardiff. Dublin. Glasgow. Leeds. Manchester. Newcastle-on-Tyne. Sheffield. Southampton

Rheostats and Resistances, all types

Surge Protection Apparatus

Automatic Voltage Regulators

ISENTHAL

& Co. Ltd.

DUCON WORKS, VICTORIA RD.,
N. ACTON, LONDON, W.3.

Phone—Chiswick 3904.
Wire—Isenthal, London.

E.H.T. Air Break Switchgear, 3,300 to 132,000 Volts

Electrical Level Indicators

Mercury Switches and Relays

BAA

The Cell's Efficiency.

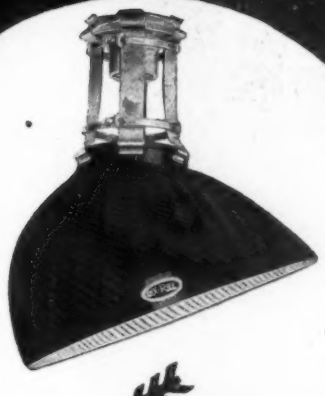
IF the acid is not chemically perfect, the reaction in the cell cannot be chemically perfect. Hence (1) waste of power, (2) damage to the cell. Use BAA., the acid that is made by Britain's leading acid manufacturers from natural Brimstone and distilled water only. Every gallon is specially tested.

THE PUREST AND BEST ACCUMULATOR ACID

F.W. BERK & Co Ltd
LONDON E.C.3
WORKS:
STRATFORD E
& MORRISTON Glam.
TEL. AVENUE 9361
(7 LINES)

TAS/be. 166.

X-Ray SHOP-WINDOW REFLECTORS



Over a long period of time X-Ray Reflectors have enjoyed a world-wide reputation as the best equipment for shop-window lighting. They are more efficient and durable than other window reflectors—prices are right, and a five years' guarantee is behind every reflector.

Add to your prestige and profits by stocking and demonstrating the best-selling window reflectors in the world. Adequate stocks are held by us, and prompt delivery is assured.

Our lighting engineers are at your disposal without obligation or charge to collaborate with you in any installation.

A new and attractive folder—No. L.423.—available for over-printing is ready. Please write for it to :—

The British Thomson-Houston Co., Ltd.,
Mazda House, Newman Street, Oxford Street, London, W.1.

Branch Offices at :— Belfast, Birmingham, Bristol Cardiff, Dublin, Glasgow, Leeds, Liverpool, Manchester, Middlesbrough, Newcastle, Sheffield and Swansea.

Guarantee

Should any X-RAY REFLECTOR deteriorate within FIVE YEARS of the date of purchase, it will be replaced free of charge providing it has been used as recommended and with a lamp of the correct rating

2941

B T-H

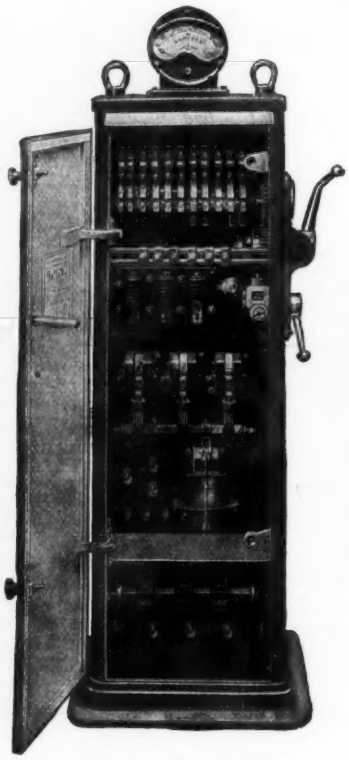
FMB FMB

FMB

STEEL CASE AIR BREAK

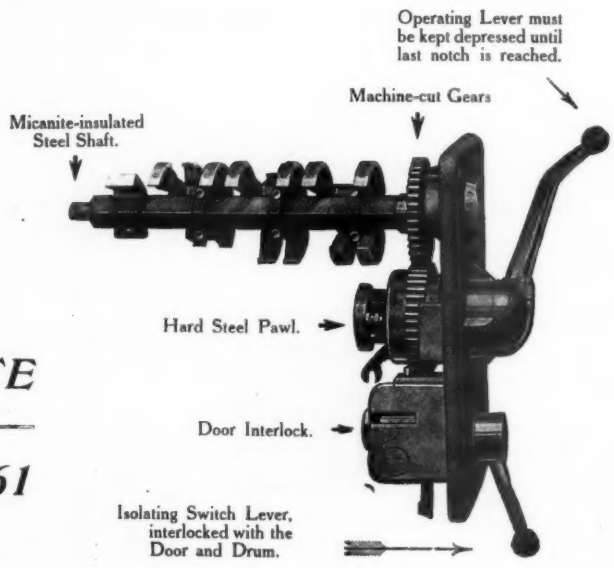
PILLAR TYPE STARTERS

FOR USE WITH A.C. & D.C. MOTORS from 1–200 h.p.



Steel Door covering Terminal and Isolating Switch Chamber removed to show interior.

OPERATING GEAR.—The Operating Gear which operates the starting drum is of the ratchet slow motion type, so arranged that the lever must be kept depressed until the last notch is reached. Should the lever be released on any but the last notch, the Contactors immediately open and power cannot be again applied to the motor unless the starting drum is brought to the first position. Inching can be obtained by simply depressing and releasing the starting lever, and when it is required to inch from a distance, suitable push buttons could be provided. The complete unit can be removed in one piece by taking out four bolts.


Operating Lever must be kept depressed until last notch is reached.
Machine-cut Gears
Micanite-insulated Steel Shaft.
Hard Steel Pawl.
Door Interlock.
Isolating Switch Lever, interlocked with the Door and Drum.

PLEASE WRITE
for
PAMPHLET No. 61

THE ELECTRO-MECHANICAL BRAKE CO., LTD.,

Electrical and General Engineers,

WEST BROMWICH, ENGLAND.

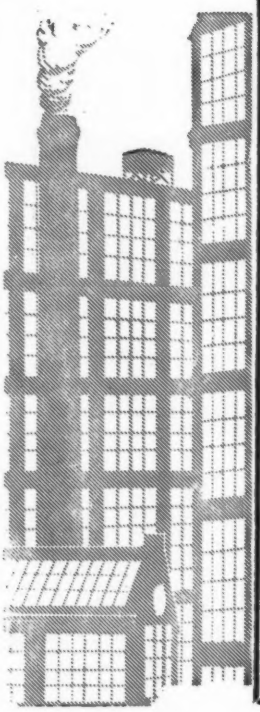
Telephone : 291 **Telegrams : "Brakes."**

LONDON
Cecil Chambers, 86, Strand.

MANCHESTER :
28, Piccadilly

BRISTOL :
Lloyds Bank Building, Small Street.

FMB FMB



Its MESSAGE is CLEAR

EFFICIENT factory signals safeguard your workers, your plant and your working hours. The matter deserves your personal investigation.

The sawtooth note of the Klaxon is heard at once. Its message is clear. It compels attention. It sounds clear above the hum of machinery or other noises.

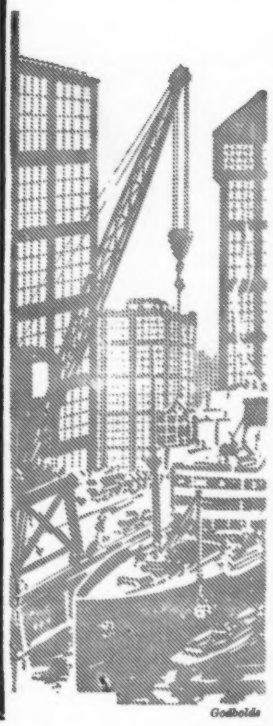
By standardising the Klaxon throughout all factories, warehouses, wharves, etc., you do away with any confusion that might arise through buzzers, gongs, bells or hooters. One Klaxon will do the work of several other signals. It is an economy because it is safest and cheapest over a long period.

Write for a copy of our Booklet dealing with the important subject of Industrial signalling.

KLAXON INDUSTRIAL SIGNALS

KLAXON LTD., 36, Blandford Street, London, W.1.

Service Stations at above address and at our Works, Warwick Road, Greet, Birmingham.



Godbolds

"ANTARCTIC FANS."

ANTARCTIC Electric Fans have well established themselves in past seasons, and we continue to offer them confident that they will each in their respective classes give the best of service. All types are represented in the range:—Swivel and Trunnion and Fixed Body Desk Fans, Oscillating Fans, Ceiling Fans, and Exhaust Fans. We carry large stocks, and prompt delivery can be made.

Write for new season's Fan Catalogue No. 602, if not already received.

THE "IDEAL" FAN.

A 9-inch Fan with Enamelled Black Iron Body, polished brass blades and guard, fitted with Universal type motor for A.C. and D.C. The Fan is fitted with a Starting Switch and two-speed Regulator and Base, and is complete with Flex and Adapter.

37/6 EACH.

THE "Ideal" Fan (*illust'd*) introduced last season proved popular with the trade and satisfactory to the user. It can be relied upon to give good service under most exacting conditions. It is "Ideal" for home and office use. A small Fan of this type should be in every home. By the protection of food stuffs alone it will save its cost many times over.

POLAR CUB 6" FAN 20/- EACH.

Falk, Stadelmann, & Co. Ltd.

EFESCA ELECTRICAL WORKS.

83-93, FARRINGDON ROAD, LONDON, E.C.1,

AND AT

GLASGOW, MANCHESTER, BIRMINGHAM, DUBLIN, NEWCASTLE & CARDIFF.

LAMP SERVICE

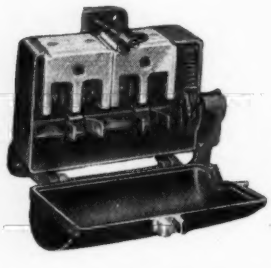
WE CARRY EXTENSIVE STOCKS OF ASSOCIATION LAMPS.

Also all makes of Radio Valves

DELIVERY BY RETURN

"Ideal" Switches and Switch Fuses

—a Sanders series that is outstanding for superiority and value.



"IDEAL" IRONCLAD SWITCHES

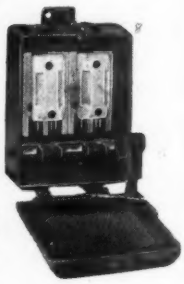
A quick make and break switch of neat design filling the need for a small good quality Ironclad Switch at a low price.

15 Amps. 250 Volts S.P. or D.P.

Approximate overall sizes S.P. 4" × 3" × 3⅛"

Approximate overall sizes D.P. 4" × 5⅜" × 3⅛".

"IDEAL" IRONCLAD SWITCH FUSES

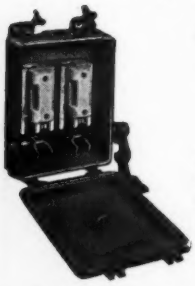


Quick make and break switch. A new design popular in connection with Housing Schemes where a small but efficient main control is required.

15 Amps. 250/500 Volts D.P. or T.P.

Approximate overall sizes :—

15 Amps.	250 Volts	D.P.	6⅛" × 5"	× 4 3/16"
,,	,,	T.P.	6⅛" × 6¼"	× 4 3/16"
,,	500 ,,	D.P.	8 7/16" × 5⅛"	× 4⅛"
,,	,,	T.P.	8 7/16" × 7 7/16"	× 4⅛"



"IDEAL" IRONCLAD WEATHERPROOF SWITCH FUSES

Quick make and break. Specially designed for outdoor use or in damp cellars, &c.

15 Amps. 250 Volts.

Approximate overall size 7½" × 6¼" × 4½".

Take advantage of the SANDERS SERVICE

Sanders do more than merely supply standard lines of Switch and Fuse Gear. They give a Switchgear Service that can supply every out-of-the-ordinary need. Special designs for special jobs submitted by their own Engineers or any piece made properly to customers' specification.

Wm. Sanders

& COMPANY

(Wm. Preston—Sole Proprietor)

Makers of "Superior" Switchgear since 1892

Falcon Electrical Works

WEDNESBURY

Telephone: Wednesbury 65. Telegrams: "Sanders, Wednesbury."

London: 128, SHAFTESBURY AVENUE

Telephone: Gerrard 8984. Telegrams: "Sandecco, Westcent, London."

BELFAST—The Walsall Hardware Manufacturing Co., Ltd., College Square North.

BRADFORD — H. Sampson, "Ashmount," Lidget Hill.

BRISTOL — V. G. Burkitt, 105, Redcliffe Street.

GLASGOW—Wm. C. Yuille & Co., Ltd., 135a, St. Vincent Street.

MANCHESTER — Norrington & London, Ltd., 33, Brazennose St.

NEWCASTLE-ON-TYNE — R. & H. Barkes, 8-13, Clavering Pl.

PLYMOUTH—T. M. Johns & Co., Ltd., Athenæum Chambers, Athenæum Arcade.

REGD. TRADE (S) MARK

"The Greatest step forward in Immersion Heater design"

—the Opinion Engineers hold of the New

"ANGELUS"

SIMPLIFIED DOMESTIC IMMERSION HEATER

Here are some of the reasons for its unqualified success :—

IT REDUCES INSTALLATION COSTS BY 75%

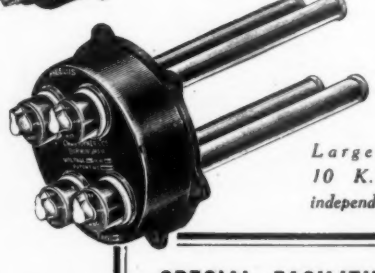
CONTACTS ARE ALWAYS IN PERFECT ALIGNMENT

CONTACT AREA AND PRESSURE CAREFULLY CALCULATED

DUAL PURPOSE SPRING WASHERS ABSORB SHOCK ON INSULATING SYSTEM AND ENSURE PERFECT ALIGNMENT

An Engineering Triumph —and British all through

Type J.1 Note that switch is plugged direct in bus-bar. No Wall gear.



Large unit, up to 10 K.W. with four independent switches.

SPECIAL FACILITIES FOR EXAMINATION AND TEST

Borough Engineers and Supply Authorities who desire to examine and test this new Immersion Heater may have a sample for this purpose on application to the makers.

All loading from ·25 to 10 K.W.

CHAS JOYNER AND COMPANY

ICKNIELD SQUARE, BIRMINGHAM

Soundest Value, Surest Satisfaction

—THE REWARD OF THE BETTER BUYER.

The more you demand in Switch and Distribution Gear, the sooner you will come to SIMPLEX. Because it embodies new principles of construction, new standards of performance and safety. Scientific analysis of duties required, and close study of every detail, have produced designs at once masterly, yet superbly simple. *And SIMPLEX superiority does not stop at the designs.*

* * *

Not only are all materials of the highest grade obtainable, but much research has been devoted, in every case, to the finding of the most satisfactory substance for its particular purpose. For instance, switch-blades are mounted on insulated bars of silver-steel, costing *nine times* as much as the ordinary steel usually employed. After a SIMPLEX switch had been operated continuously a quarter of a million times, the silver-steel bars were entirely unaffected by wear.

* * *

The fuse unit is something very greatly in advance of the ordinary Home Office fuse. It deals with both overloads and short circuits with surprising ease. The wonderful new arc-quenching material in carrier and base has an efficiency which is indeed *a revelation in fuse performance.* Both parts are self-locking, and cannot loosen under vibration, while renewal of fuse wire is made extremely simple.

MANUFACTURED UNDER SIMPLEX PATENTS
SIMPLEX
STANDARD
DISTRIBUTION & SWITCH GEAR
SIMPLEX CONDUITS LIMITED
MANUFACTURING ELECTRICAL ENGINEERS
BIRMINGHAM
AND REGISTERED DESIGNS

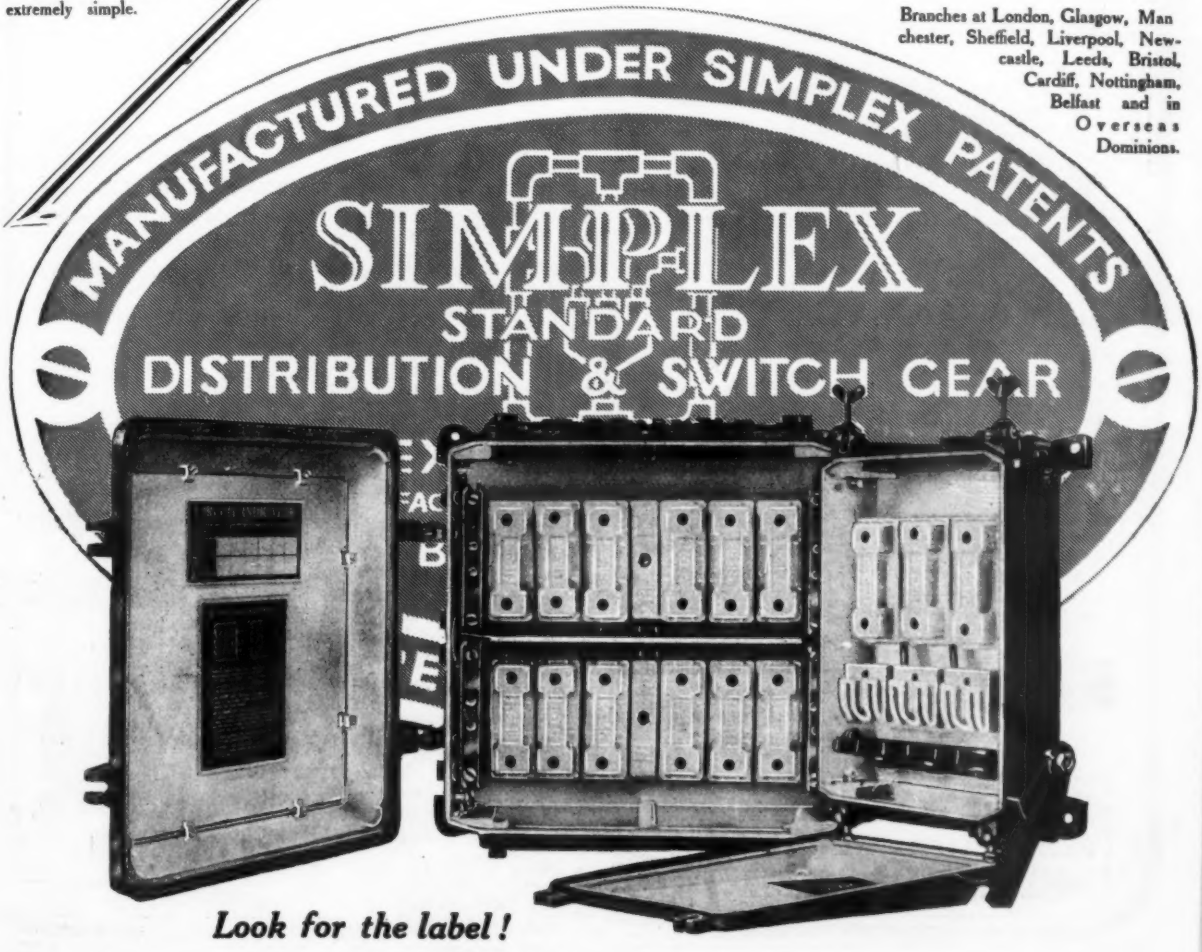
Every article bears this metal label—a symbol of SAFETY and SERVICE.

But only by demonstration can you learn how far ahead SIMPLEX really is. Test it for yourself. You will be amazed that such ultra-modern and efficient gear can be produced at such *COMPETITIVE PRICES.*

SIMPLEX CONDUITS LTD.

Head Office & Works : GARRISON LANE, BIRMINGHAM.

Branches at London, Glasgow, Manchester, Sheffield, Liverpool, Newcastle, Leeds, Bristol, Cardiff, Nottingham, Belfast and in Overseas Dominions.



Look for the label!

A HIGHER STANDARD IN SAFETY FIRST ELECTRICAL ACCESSORIES

"GUARDIAN" (PAT.) SAFETY HAND LAMP

To comply with H.O. Regulations
As supplied to Government Depts. Shipyards, Corporations and leading Engineering firms.

"GUARDIAN" Type G.1 Hand Lamp (as illus.), complete with heavy Guard and Holder. Price 7/- each.
With Push-bar switch 9/-

Refuse inferior substitutes.

Full details of wide range of Hand Lamps on request.

PLUG and SWITCH.

IRONCLAD SWITCH.

"BANQUO" PLUG AND SWITCH.

WATERPROOF COMBINED INTERLOCKING.

Reliable and substantial design. Iron Base - screwed for conduit with 2-pin and earthing plug, enclosed in gun-metal case and fitted with cord grip. A cap, fitted with chain, protects the current-carrying parts when plug is out.

No. A10/10.	5 Amps. Without Plug ...	10/6 each.
No. A10/11.	5 Amps. Extra for 3-pin Plug in Gun-Metal Case	6/9 "
No. A10/12.	10 Amps. Without Plug ...	15/- "
No. A10/13.	10 Amps. Extra for 3-pin Plug in Gun-Metal Case	7/6 "

Subject Trade Discount.

IRONCLAD SWITCH

Robust design.

SINGLE POLE,	5	amps.	cap.	1	way	...	...	...	5/6
DOUBLE ,,	5	,,	,,	1	,,	...	...	...	9/-
SINGLE ,,	15	,,	,,	1	,,	...	...	...	9/-
DOUBLE ,,	15	,,	,,	1	,,	...	...	..	18/-

Subject Trade Discount.

"BANQUO" (Regd.) SWITCHES *and Plugs are installed in the largest and most important Engineering Works and Factories in* **GREAT BRITAIN.**

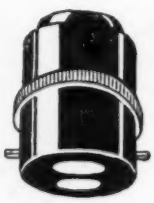
"G.P.O." HAND LAMP

No metal parts exposed—guard being of insulated material. The Reflector permits the light to be thrown where desired.

List No. S.F./90
Price 10/- each.

List No. S.F./91 (with switch-holder) Price 12/6 each.

Price subject trade discount



MOULDED LAMPHOLDER SAFETY ADAPTOR

Brown finish. Well designed. Heavy Elliptical Contacts. Effective Cord Grip Design.
List No. SF/56. 7/6 doz. *Subject.*

"GOLTONE" S.F.

"GOLTONE" INSULATED HOLDERS

—For Safety and Security.

No metal is used in the construction of "GOLTONE" INSULATED HOLDERS other than contacts. Finished in Brown, Black or White.

These Holders are Shock-proof, Light in Weight, of Neat Appearance, and Prices are competitive.

Full particulars on request.

DOCK & FACTORY HEAVY CURRENT WATERPROOF PLUG.

As supplied to the War Office and important Government, Railway and Dock Contracts.

Provided with stout earthing connection.

The screwed cap, fitted with chain, protects the current carrying parts from exposure when plug is out.

Made in all sizes from 20 to 200 amps.

See Catalogue No. A/107, for details and prices.

"IZOLEX"

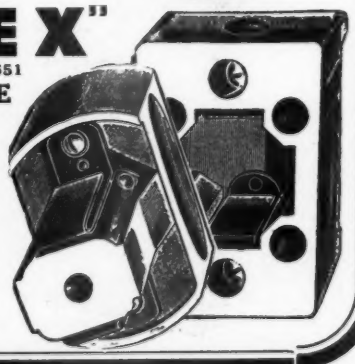
(REGD.) PATENT No. 121651

REPLACEMENT FUSE

Safest and Best.

Parts are easily replaceable, Solid contact plates in base, Phosphor Bronze hard spring contacts in carrier. Size 15 amps. (at 250 volts capacity). Price complete, 1/5 subject.

Details of full range sent on request.



ALL LINES ADVERTISED ARE MANUFACTURED AT OUR **PENDLETON WORKS.**

Send for Lists.

Ward & Goldstone PENDLETON MANCHESTER Ltd.

Printed by The Premier Linotyping and Printing Co., Ltd., 21-26, Dean Street, Fetter Lane, E.C.4, and Published by The Electrical Review Ltd., 4, Ludgate Hill, London, E.C.4.

Specify

"L.P.S.-DUDLO" ENAMELLED WIRE

and eliminate your winding troubles

TRADE MARK

There are very few commodities that are so seemingly easy and yet so difficult to make satisfactorily in ***commercial quantities*** as Enamelled Copper Wire.

From the nature of the product it is extremely difficult to detect manufacturing faults in any one reel. You cannot afford to examine every one hundred yards of every reel you use, and yet this is what you must needs do—unless you use *"L.P.S.-DUDLO"* Enamelled Wire.

This is why so many magneto, telephone and wireless engineers specify "L.P.S." for safety.

The processes employed in the manufacture of "L.P.S.-DUDLO" Enamelled Wire are far and away ahead of those of any other make, and that is why you can always depend on every reel of "L.P.S.-Dudlo" wire—no matter how many thousands you may use — being good from beginning to end.

Remember, it is not the high voltage resistance of any stretch of wire on any reel that matters, but the uniformity of enamel and evenness of winding that count, and these characteristic qualities you find unfailingly in "L.P.S.-Dudlo" wire, and in that alone.

THE L.P.S. ELECTRICAL COMPANY, LTD.

AVENUE ROAD :: ACTON :: LONDON, W.3

Telephone: **Chiswick 1920 (2 lines).** ***Telegrams:*** **Engineyor, Act, London.**

PROFITABLE INSTALLATIONS!

By using St. Helens C.T.S. Wiring System time and labour is saved, and stocks are enormously reduced.

St. Helens C.T.S. System can be quickly and economically installed as a surface system without the attendant trouble and mess of cutting away brickwork or plaster decorations that the more rigid systems necessitate.

St. Helens C.T.S. can be papered, painted, or plastered over without any ill effect, giving the job that "little extra" finish rendering it at the same time perfectly inconspicuous and neat.

C.T.S. Installations can be carried out in half the time required for other systems.

Our latest Illustrated Booklet "Wiring" will be of interest to you and your clients. May we send you a copy? For your next installation use

ST. HELENS

THE ORIGINAL

C.T.S. SYSTEM

ST. HELENS Cable & Rubber Co., Ltd., SLOUGH

'Phone: 333 (3 lines). *'Grams: St. Helens.*

This *inner tube* reduces wear on the *outer* cover!

Pat. No. 217379.

Everlastic Tubes are of very robust construction. Made of the finest red rubber and have in addition an insertion of tough black rubber (C.T.S.) which is thickened at the tread portion. Because of the extra support given to the outer cover by this exceptionally thick tube lower inflation pressures are permitted. Wheelspin is practically eliminated and life of the outer cover considerably increased.

Write for further particulars and sample sections of the trouble preventing inner tube.

EVERLASTIC

PUNCTURE RESISTING

MOTOR INNER TUBES

DRAKE & GORHAM WHOLESALE,
LIMITED,
67, LONG ACRE,
LONDON, W.C.2.

Electric Fans

BRANCHES:
MANCHESTER - - - 29, Piccadilly.
GLASGOW - 58, West Campbell Street.
BELFAST - - - 83, Victoria Street.
BRISTOL - - 35, Broad Street.
LIVERPOOL- 9, Granite Bldgs., 6, Stanley St.
BRIGHTON - - 24, Marlborough Place.
DUBLIN - 2, Church Lane, College Green.
Midland Representative: W.T. BOWER, 184, Jockey Road, SUTTON COLDFIELD.

WRITE FOR
Illustrated Catalogue.

CINEMA CURTAIN CONTROL GEAR

SUITABLE FOR LIGHT LIFTS.

WE MANUFACTURE
Electric Signs. Sign Controllers. Resistances. Stage Battens. Footlights. Dimmers. Flood & Focus Stage Arc Lamps. Half-Watt Flood & Focus Projectors, and Special Lighting Effects for Theatres and Ballrooms.

AUSTIN WALTERS & SON, LTD.,
GAYTHORN ELECTRIC WORKS,
MANCHESTER.

Sole Agents: London, South and Export:
Messrs. S. G. LEACH & Co., Ltd., 26-30, Artillery Lane, LONDON, E.C.

"SISTOFLEX" (Regd.)
Electrical Insulating Materials.

Prices Competitive.

Best Qualities.

Prompt & Efficient Service.

Varnished Cloth, Silk Paper & Tapes. Presspahn in sheets, rolls and tapes. Lebakite bakelite sheets, rods, tubes. Fine cloth sheets. Vulcanized Fibre sheets, rods, tubes and machined parts. Leatheroid Black adhesive Tape. Flexible varnished Tubes. Grey India and Egyptian Tapes. Jap Tissue—Red Rope Paper. Dark Grey Fuller board. Arma Slot Insulation, etc., etc.

Buy our Qualities, proved by continuous use to give satisfaction.

Telegrams, "Nykoping, Lud, London."

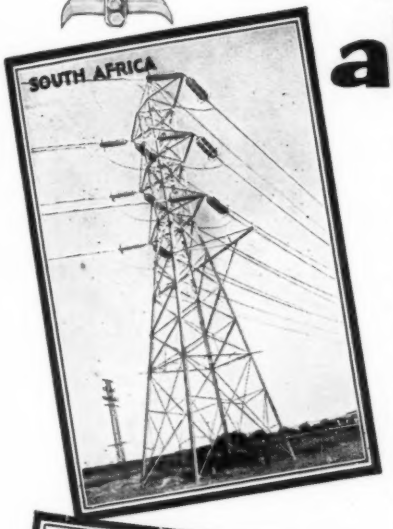
SPICERS
LIMITED,
INSULATION DEPT.,

Telephones: City 6251 Private Exchange (Extension 49).

19, NEW BRIDGE STREET, LONDON, E.C.4.

Bullers

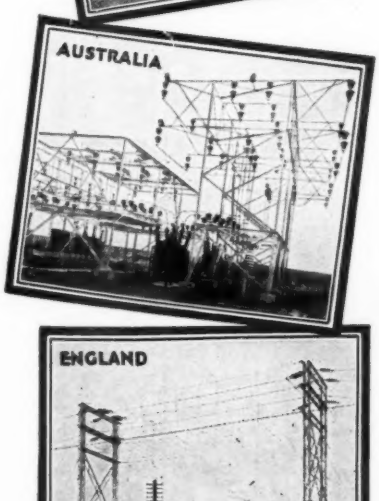
Insulators and Equipment for all voltages

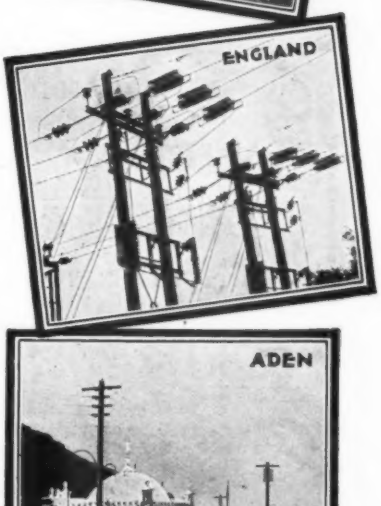


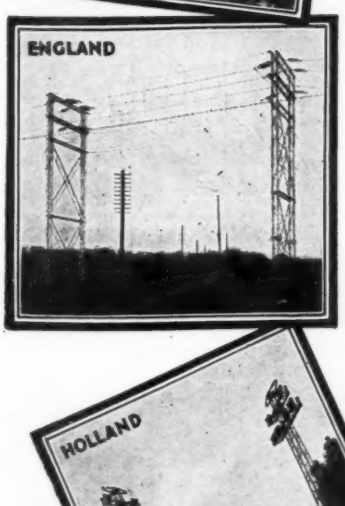
These illustrations are taken from actual photographs of Bullers Overhead Line Equipment in service in all parts of the world.

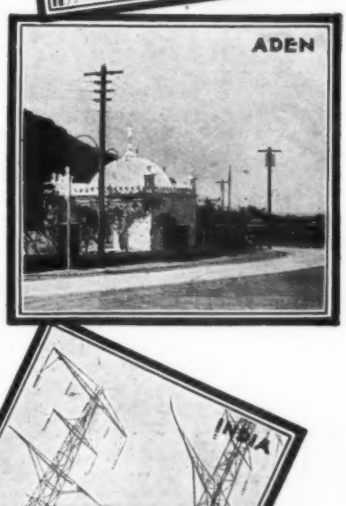
Bullers manufacture Insulators and accessories for all voltages to give satisfactory service under any climatic conditions.

SOUTH AFRICA. 132 k.v. *Witbank-Brakpan Line.*
AUSTRALIA. 66 k.v. *Thomastown, Victoria, substation.*
ENGLAND. 66 k.v. *Steel Tower Crossing.*
HOLLAND. 44 k.v. *Road Crossing.*
NEWFOUNDLAND. 66 k.v. *Transmission Line.*
INDIA. 100 k.v. & 110 k.v. *Bombay Presidency.*
ADEN. *Low Tension Distribution.*
ENGLAND. 33 k.v. *Overhead Transmission Line. Tapping point.*
NEW ZEALAND. 11 k.v. *Horowhenua Scheme.*



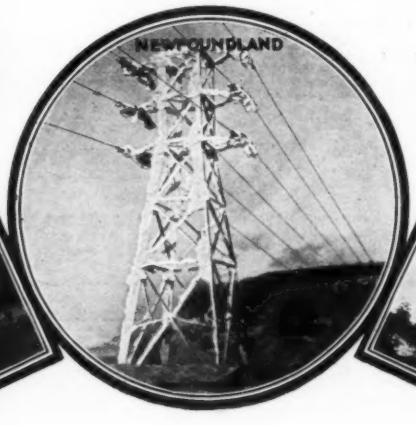






Bullers
LIMITED

6 Laurence Pountney Hill
London, E.C.4
Telephone : City 0985 & 0986
Porcelain Works, Hanley, & Milton, Staffs.
Ironworks, Tipton, Staffs.



Standard
FEEDER & DISTRIBUTION
LOW TENSION
CABLES

The illustration shows a ·4 sq. in. Triple Concentric Low Tension Cable to British Engineering Standard Specification.

A typical Cable of this class as manufactured by :—

Standard

Telephones and Cables Limited

CONNAUGHT HOUSE, ALDWYCH, LONDON, W.C.2.

Telephone: Holborn 8765 (15 lines).

Works: HENDON, NORTH WOOLWICH, NEW SOUTHGATE.

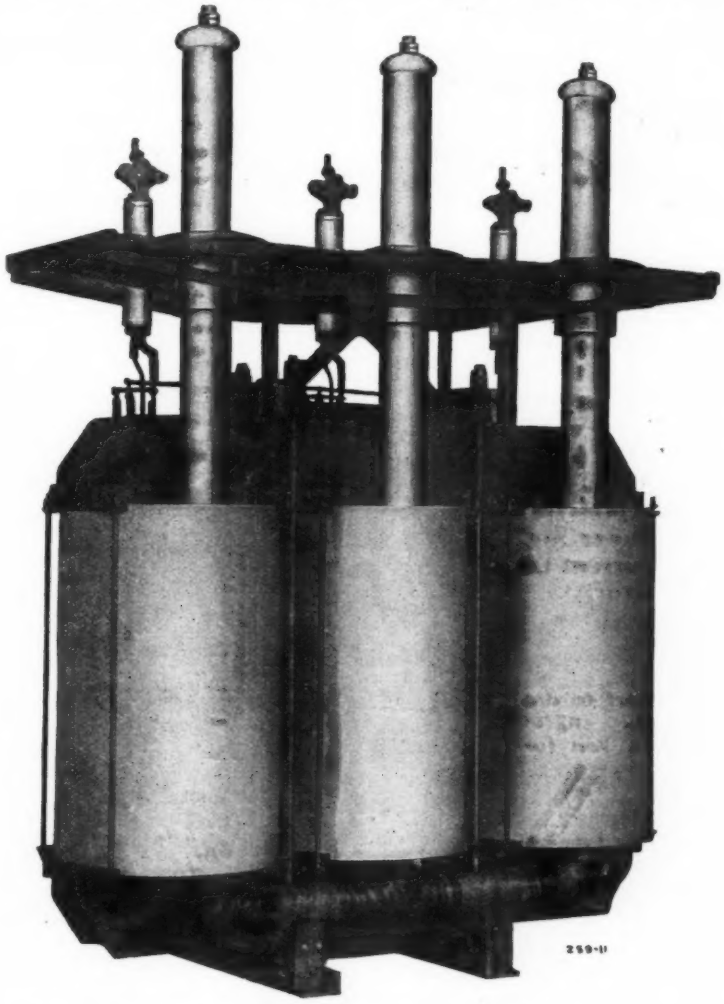
Branches

Birmingham, Leeds, Manchester, Glasgow, Liverpool & Dublin.

MICAFIL

INSULATING MATERIALS

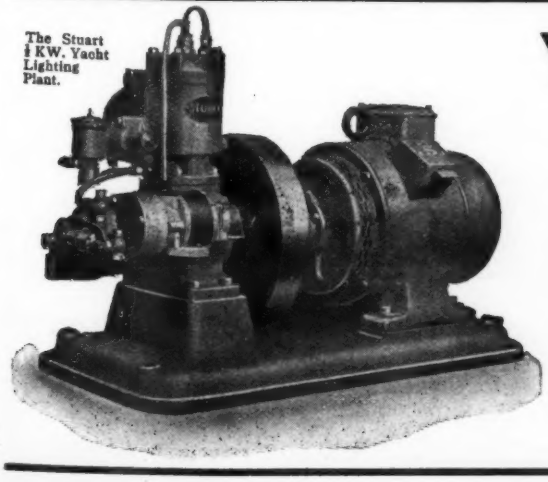
for Transformers, Switchgear and other Electrical Plant.



MICAFIL Ltd., Zurich-Altstetten (Switzerland).

Sole Concessionnaires for Great Britain and Dominions :

IMPAG Ltd. 88, Fenchurch St., **LONDON, E.C.3**



The Stuart 1 KW. Yacht Lighting Plant.

YACHT LIGHTING

On board yachts and motor boats, even more than on land, quietness and freedom from vibration are essential. That is why a Stuart plant is usually specified.

Stuart plants are equally satisfactory for land and marine installations.

Made in all sizes from six to one hundred lights.

Please send details of the number of lights and ask for list 24 R.

STUART TURNER LTD.,

CONTRACTORS TO H.M. GOVERNMENT

HENLEY-ON-THAMES, 'Phone 186.

London Office: 36, Chandos House, Palmer Street, Victoria Street, S.W.1.

'Phone: Franklin 6313.

You can secure economy

By using Dubilier Condensers for Power Factor correction you gain a considerable saving in the cost of current; for you cease to pay for "wattless" current—current which does nothing but heat up cables and switchgear. And you gain the advantage of preferential rates which many Power Supply Companies give for current taken at a high power factor.

We will send an expert to discuss the question with your engineers, so write to us before you forget.

DUBILIER CONDENSERS

—in your current expenses

DUBILIER
Regd. Trade Mark

Advt. of Dubilier Condenser Co. (1925), Ltd., Ducon Works Victoria Road, North Acton, W.3.

M161

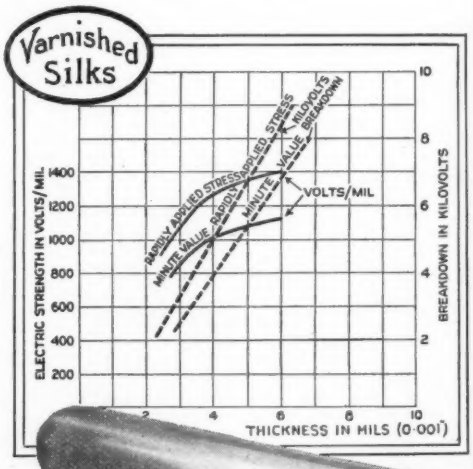
TESTED INSULATION

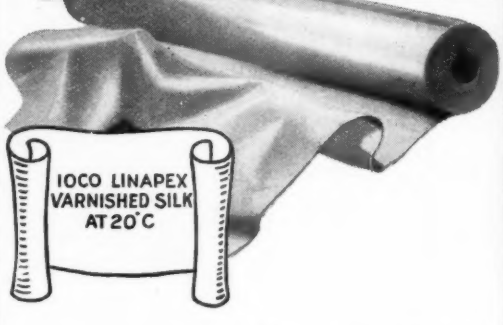
'Linapex' Varnished Silk

The insulation of small coils where high insulating properties are necessary, and where only small spaces are available, calls for the use of 'Linapex' Varnished Silk or Silk Tape.

Generally, the silk fulfils a similar function to that of 'Linapex' Varnished Cloth, but takes up much less space for a given electric strength.

Characteristic values are shown in the curve reproduced below—





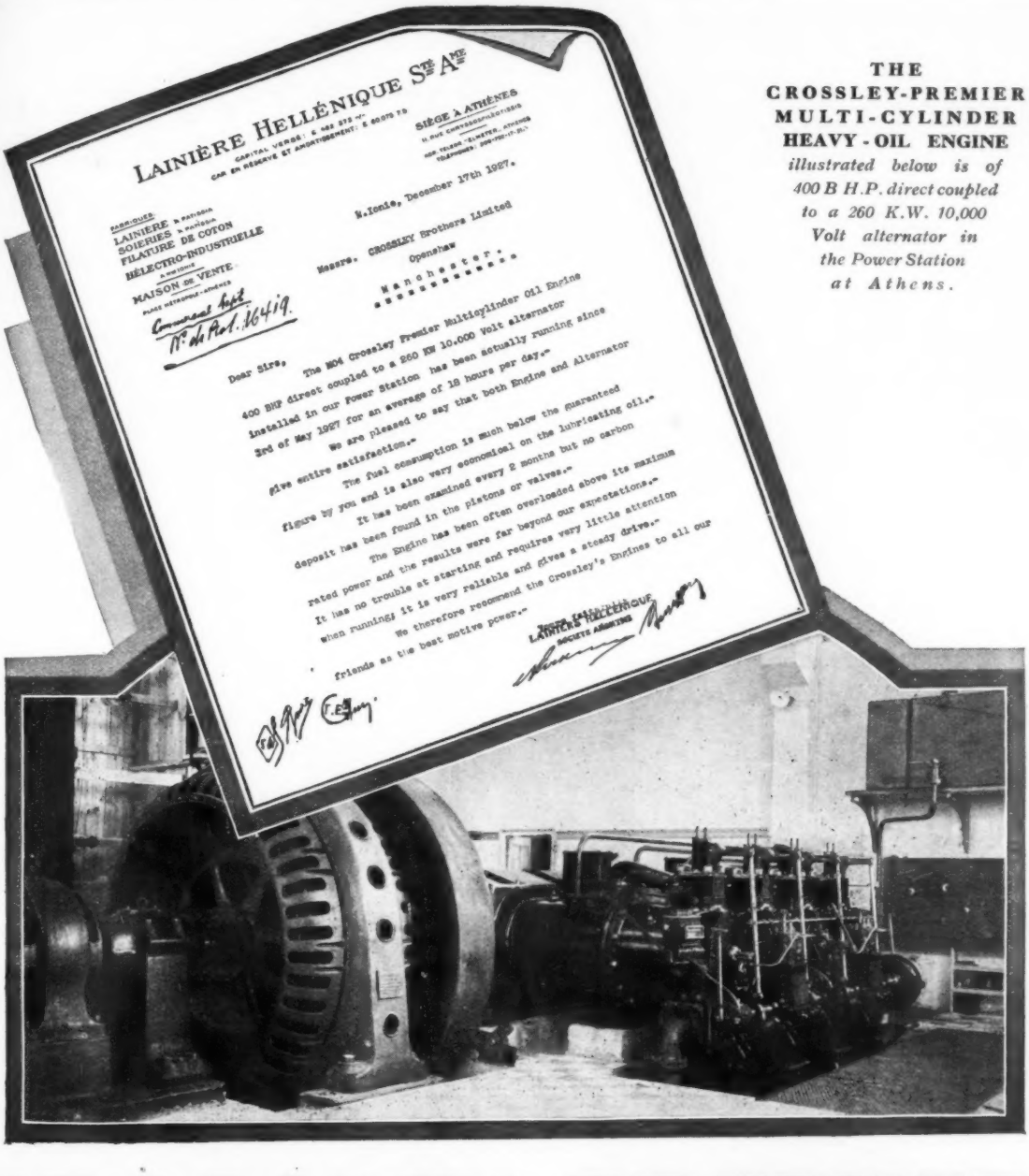
'Linapex' Varnished Silks are supplied in piece, or in tapes of various widths—straight cut or bias cut as required.

For complete details and prices of 'Linapex' Varnished Silks and Cloths send for List No. 10

IOCO

Ioco Rubber & Waterproofing Co. Ltd.

Anniesland . . . Glasgow


LAINIÈRE HELLÉNIQUE S^te A^me
SIÈGE A ATHÈNES
Athens, December 17th 1927.
Messrs. CROSSLEY Brothers Limited
Openshaw
Manchester.
Dear Sirs,
The M04 Crossley Premier Multicylinder Oil Engine
400 BHP direct coupled to a 260 KW 10.000 Volt alternator
installed in our Power Station has been actually running since
3rd of May 1927 for an average of 18 hours per day.
We are pleased to say that both Engine and Alternator
give entire satisfaction.
The fuel consumption is much below the guaranteed
figure by you and is also very economical on the lubricating oil.
It has been examined every 2 months but no carbon
deposit has been found in the pistons or valves.
The Engine has been often overloaded above its maximum
rated power and the results were far beyond our expectations.
It has no trouble at starting and requires very little attention
when running; it is very reliable and gives a steady drive.
We therefore recommend the Crossley's Engines to all our
friends as the best motive power.

THE CROSSLEY-PREMIER MULTI-CYLINDER HEAVY-OIL ENGINE *illustrated below is of 400 B H.P. direct coupled to a 260 K.W. 10,000 Volt alternator in the Power Station at Athens.*

CROSSLEY-PREMIER
HEAVY-OIL ENGINES

are unequalled for economy of performance and reliability of service. Their smooth, even running and steady drive make them particularly suitable for driving of alternators in parallel.

Multi-Cylinder CROSSLEY-PREMIER HEAVY OIL ENGINES are made in various sizes from 200 B.H.P. to 1,000 B H.P. SINGLE and DOUBLE CYLINDER TYPES from 6 B.H.P. to 280 B.H.P.

Also Gas Engines and Gas Plants in various sizes from 2 B.H.P. to 1,000 B.H.P. and Petrol-Paraffin Engines from 2 B.H.P. to 20 B.H.P.

THE PREMIER GAS ENGINE COMPANY, LIMITED,
SANDIACRE - - - - - - Near NOTTINGHAM.

Telegrams: Premier, Sandiacre. Telephone: 39, Sandiacre. London Office: 139-141, Queen Victoria Street, E.C.4.

P.22

Established 1874.

QUALITY.

EARLE, BOURNE & CO., LTD.

Contractors to the British Railways, British, Colonial, French, Belgian and Italian Governments, Admiralty and India Office.

LOCOMOTIVES & CONDENSER TUBES.

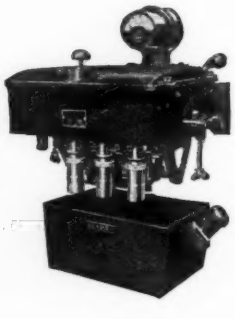
SOLID DRAWN and BRAZED BRASS and COPPER TUBES for the Electrical Trade.

COLD ROLLED BRASS AND COPPER.

BIRMINGHAM ROLLING AND TUBE MILLS,

HEATH STREET SOUTH, Telegrams: "TUBING, BIRMINGHAM." Telephone Nos.: Edgbaston 2141 (4 lines) and 2379. **BIRMINGHAM.**

Also at LONDON, MANCHESTER, GLASGOW, NEWCASTLE, SHEFFIELD and BELFAST.



AEM

BEAM WIRELESS.

"Airedale" starters as illustrated are installed in the Beam Wireless Stations throughout the world. They are in continuous service throughout the year and giving ***Complete Satisfaction.***

Are YOU using "Airedale" gear?

Leaflet 2613 includes full particulars of the Starter illustrated.

Airedale Electrical & Mfg. Co., Ltd.

REG. OFFICE Bowling Old Lane. WORKS Ryan Street

TELEPHONE Bfd 2068 BRADFORD GRAMS: SWITCH Bfd.

The articles illustrated are lacquered with Canning lacquers.

Lacquers

for all purposes

WE manufacture lacquers for every finish. No matter what your need may be, our wide range will furnish the ideal lacquer. Here are a few of our range—

"ERCALENE" "THERMOLENE"
"FRIGILENE" "LUSTROID"
"LACTRENE" Etc., Etc., Etc.

We will gladly send you literature and details on application.

For Brushing Fig. 1 Dipping Fig. 2 & Spraying Fig. 3

W. CANNING & Co. LTD.

133-137, GREAT HAMPTON STREET,

BIRMINGHAM,

LONDON & SHEFFIELD.

THE LATEST

E.P.E. Product.

1 to 40 H.P. Motors.

Our New Range of D.C. Motors.

To BRITISH ENGINEERING STANDARDS.

(*B.E.S.A. Spec. No. 168/1926.*)

ELECTRICAL POWER ENGINEERING CO. (B'HAM) LTD.,

STECHFORD, BIRMINGHAM.

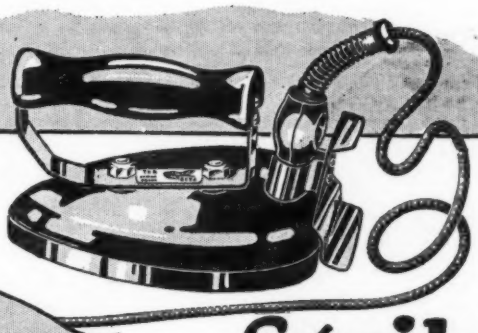
London Office:

J. S. PLUMTREE, A.M.I.E.E.,

90-91, High Holborn, W.C. 1.

MANCHESTER: 33, Brazennose Street.

GLASGOW: 204, Bath Street.



No. E9182.
A cheap and serviceable Iron with white enamelled top terminal protector and rest, polished Ebonized wood handle, easily detachable and well insulated.

No. E9181.
Heavily nickel-plated and highly polished, fitted best quality heating element, well insulated. No better obtainable.

Strike while the Iron's Hot!

Order your stocks of these two highly efficient and rapid selling Electric Irons NOW. Absolutely the latest thing in Irons—strong, reliable and efficient.

Fuller particulars, prices, etc., from:
The Welsbach Light Co., Ltd.
Welsbach House, King's Cross, London, W.C.1.
Branches at Birmingham, Bristol, Hull, Edinburgh, Leeds, Manchester, Stoke-on-Trent and Dublin.

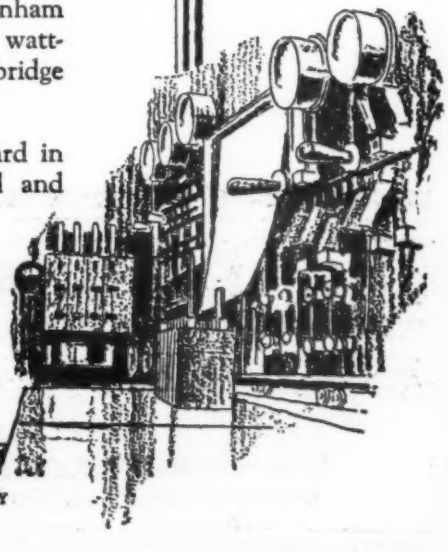
WELSBACH 639
ELECTRIC
DOMESTIC APPLIANCES

The eye that looks over the hill

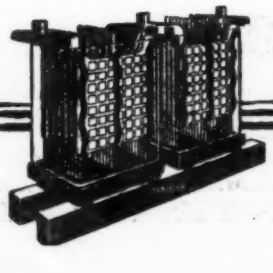
If there is one thing which has placed, and maintained the Pritchett & Gold and E.P.S. battery upon the plane it now occupies, that thing is research.

Part of the laboratory equipment of the great Dagenham Works is given up to electrical experiment. Here watt-meter and microscope, test tube and Wheatstone-bridge are for ever looking over the hill after to-morrow.

That is why there has never yet been a step forward in accumulator design, but what a Pritchett & Gold and E.P.S. Battery was one of the first to take it.



PRITCHETT & GOLD
AND
E.P.S
ACCUMULATORS



PRITCHETT & GOLD and E.P.S. COMPANY
LTD. (Incorporating Peto & Radford),
50, Grosvenor Gardens, London, S.W.1
Telephone: Victoria 3667 (5 lines)
Works: DAGENHAM DOCK, ESSEX

We make nothing but conductors, and we have been making them for 48 years. Pure Copper, either hard or bright-annealed. Finest wire, or heaviest rods. Thin strips or large busbars.

COPPER

-the Link!

FREDERICK SMITH & CO

INCORPORATED IN THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LTD

ANACONDA WORKS, SALFORD, Near MANCHESTER

Associated with

The LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED

The LIVERPOOL ELECTRIC CABLE COMPANY LIMITED

FERRANTI

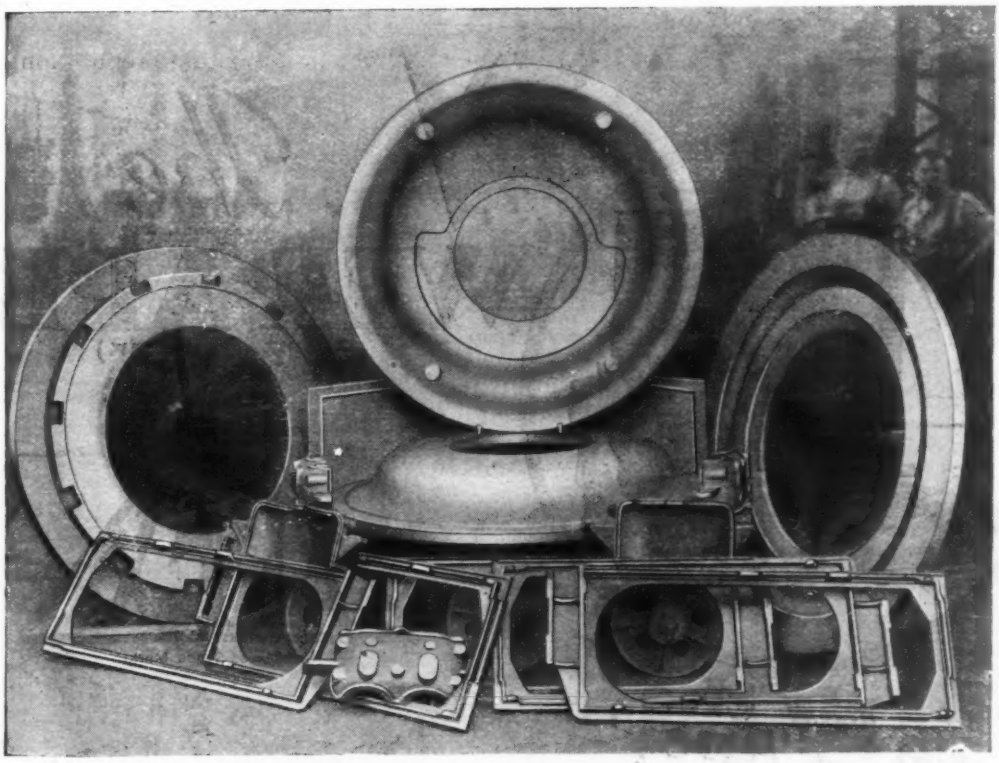
NOMAG

NON-MAGNETIC CAST IRON

(FERRANTI-DAWSON PATENT No. 204598).

NOMAG has electrical resistance higher than iron and permeability as low as brass. It is therefore admirably suited for use where there is danger of undesired eddy currents, or where high electrical resistance is required.

	Magnetic Permeability. Maximum.	Specific Resistance Micro-ohms per cm. cube.
Ordinary Cast-Iron	330·00	95·0
NOMAG	**1·03**	**140·0**
Brass	1·00	7·5

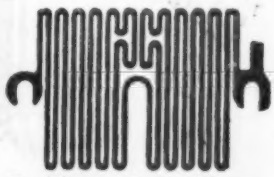


NOMAG End Shields and Plates for Machines and Frames for Switchgear.

Resistance Grid 1·25 lbs.

Grids off Customers' Patterns.
Nothing too large.
Nothing too small.

SEND US YOUR ENQUIRIES.



Resistance Grid 1·82 lbs.

FERRANTI Ltd. **Hollinwood** **Lancashire**

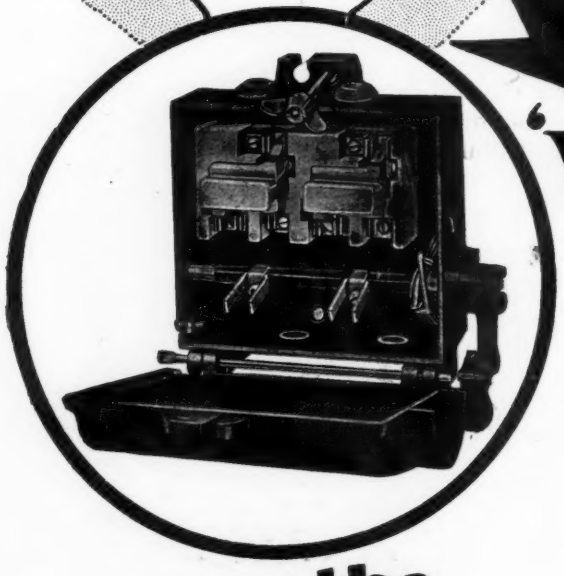
LEEDS CORPORATION ACCEPT THE 'WEE-APEX' FUSED SWITCH

on the following test :-

By permission of Leeds Corporation we publish a Test carried out by them, on the 15th February, 1928, on the 'WEE-APEX'—5/10 amp. Fused Switch. This Switch was taken from stock.

5 amps. for 10 minutes ... Cold. 15 amps. for 10 minutes... Slightly warm.
10 amps. „ 10 „ ... „ 20 amps. „ 10 „ ... Hot.
1000 Volts between poles for 15 minutes ... ...O.K.
1000 Volts between Contacts and Case for 15 minutes ... ...O.K.
A breakdown voltage test was then applied, and the insulation stood up to 6,500 between poles but then flashed over to the case.

The above test is on the Switch. The Fuse was tested by the National Physical Laboratory, and was entirely satisfactory for the requirements of a 10 amp. Fuse.



The **'WEE-APEX'**
(TRADE MARK)

APEX
(Registered Trade Mark)

Write for the Book of 'Apex'

FOSTER
ENGINEERING CO., LTD.,
MORDEN WORKS, WIMBLEDON, S.W.19.

WIMBLEDON 1800 FOUR LINES. Private Exchange. FOSTERACO, 'PHONE LONDON. A B C Code 5th.
Branches :—BELFAST, BIRMINGHAM, BRISTOL, GLASGOW, LEEDS, LIVERPOOL, NEWCASTLE-ON-TYNE, SHEFFIELD, S. WALES and all BRITISH OVERSEAS DOMINIONS.
ESTABLISHED 1903.

It's a fine tree

—but it rather hides the Church we wished to photograph. The point is that Rennington Church, near Alnwick, is wired throughout with the Macintosh Wiring System and supply is taken underground from the Vicarage distribution board, some way away, by means of "Maconite" Insulated Armoured Cable. The installation was carried out by Mr. George Clarke, of Clayport, Alnwick.

For church wiring the Macintosh System is ideal. In the majority of cases the wires in a church must be run on the surface and they must not be conspicuous. The Macintosh System just meets these requirements. It is easily fixed to any surface, which in the case of a church, is usually of stone or wood; and the narrow satin walnut covering to the wires lends itself to simple treatment to make it merge into its surroundings. It is for these reasons that the Macintosh System has been chosen for so many churches and for so many buildings of a similar nature.

The "Maconite" insulation and sheathing of the wires ensures complete safety and freedom from deterioration or breakdown caused by dampness or other difficult situations.

For neatness, safety and economy use

The Macintosh

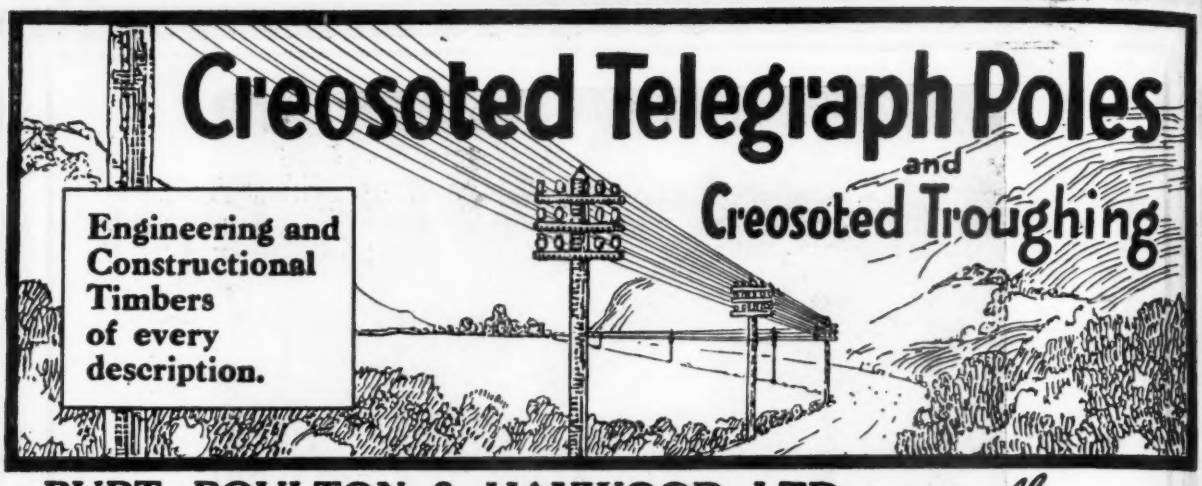
(Patented) WIRING SYSTEM

THE MACINTOSH CABLE CO., LTD., DERBY.

LONDON: St. James's House, St. James's Street, S.W.1.

SW-68.

Creosoted Telegraph Poles and Creosoted Troughing



Engineering and Constructional Timbers of every description.

BURT, BOULTON & HAYWOOD, LTD.,
SALISBURY HOUSE, LONDON WALL, E.C.2.
Depots: London, Southampton, Newport, &c.

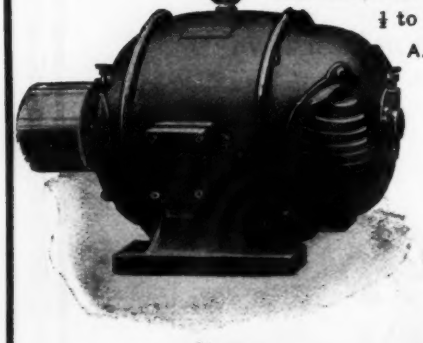
For all Timber Requirements

WESERHUETTE
CABLE-LAYING MACHINE.

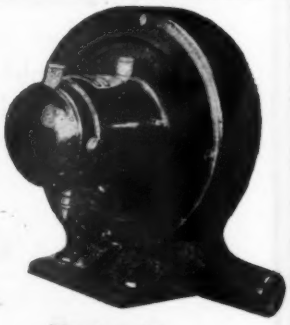
Revolutionises Cable-Laying and effects enormous saving of time and costs. The Machine illustrated digs a trench, lays a cable, refills the trench and firmly rolls and levels the loose earth, the combined operation being simultaneous. Up to 800 yards of Cable can be laid in 8 working hours for which work only 4 men are required, whereas 200 men would be necessary to lay this amount of Cable in the same time by hand. This attainment proves a perfect design, and has solved the problem of scientific cable-laying.

RICHTER & PICKIS, 6, CRESCENT, MINORIES, E.C.3.
'Phones: Royal 7751-2. 'Grams: "Ricanpick, Ald., London."
British Representatives for the makers, Eisenwerk Weserhuette, A.G.—Bad Oeynhausen, Germany.

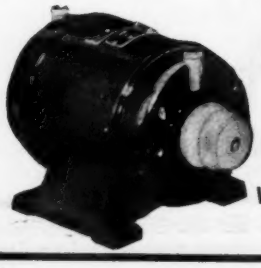
R.E.M. MOTORS
½ to 250 H.P.
A.C. & D.C.



FORGE BLOWERS (UNIVERSAL).



ELECTRIC SIRENS,
MORSE and CONTINUOUS NOTE.



FRACTIONAL H.P. MOTORS (UNIVERSAL), 1/80 to 1/6 H.P.

VERTICAL TYPE MOTORS
1/30 to 1/6 H.P.
(UNIVERSAL).

LEWIS V. McKENZIE,
95, GT. EASTERN STREET, LONDON, E.C.2.

AGENTS WANTED in the North of England, Scotland, Wales, Ireland and the Colonies.

SEWING-MACHINE MOTORS
WITH BRAKE.

FISH·SPINES

It has been found that insulating beads, particularly foreign makes, are so liable to gap and break that their use is dangerous.

Our "Fish Spine" Beads, because of their unique quality, are the most efficient and economical beads for all electrical purposes involving flexible connections.

"Fish Spine" Beads are made of hard wearing, reliable porcelain. They are perfectly vitreous, damp-proof, dust-proof and so well fitted that they cannot gap.

Immediate delivery from our works or from our London Office.

Remember that "Fish Spine" is the registered design of a reliable product, manufactured in England by a British Firm with nearly sixty years' experience of porcelain manufacture.

TAYLOR TUNNICLIFF
(REFRACTORIES) LIMITED

Head Office: EASTWOOD, HANLEY, STAFFS.
Telephone: Hanley 5272.
Telegrams: Eastwood, Hanley.
London Office: 110, CANNON ST., E.C.4.
Telephone: City 6620.

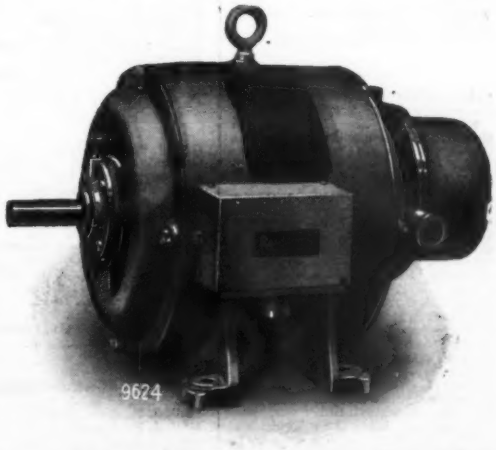
DESIGN
MATERIALS
WORKMANSHIP

of the highest class are embodied in

Ransomes
Electric Motors
A.C. & D.C.

Buyers of Ransomes' Electric Motors are assured of a plant with low temperature rise, high overload capacity and efficient insulation. They are built to uphold a world-wide reputation for high class engineering products. Unless otherwise ordered every machine is thoroughly tested to comply in every respect with B.E.S.A. specification 168/26.

Catalogues and all information will be sent on application. Also particulars of our steam and oil-driven generating sets, motor generator sets, &c.



Ransomes, Sims & Jefferies, Ltd.,
IPSWICH ENGLAND.

INDEX TO ADVERTISERS.

Advertisers will please note that New Copy and Alterations to Existing Advertisements (with Blocks) should reach this Office not later than THURSDAY MORNING of the week previous to issue.

PAGE

Accumulator Makers' Assoc. ...
A.C.E.C. (Ateliers de Constructions Electriques de Charleroi)
Airedale Electrical Manufacturing Co., Ltd.... xxxvi
Ajax, Ltd. xlvi
Alfa-Laval Co., Ltd. ... Sup. 37
Allen West & Co., Ltd. ... ...
Armorduct Cable Co. xlvii
Armstrong, Addison & Co. ...
Armstrong, Stevens & Son ...
Arora Co. ... ... Sup. 34
Arrol Johnston & Aster Engineering Co., Ltd. ... ...
Ashdown, H. E. (B'ham), Ltd. vii
Ashford, Dunn & Co., Ltd. Sup. 34
Austin & Hayes ... ... Sup. 34
Automatic Telephone Mfg. Co., Ltd. iv

B.A. Manufacturing Co., Ltd....
Bailey, Sir W. H., & Co., Ltd.... xvii
Bakelite, Ltd. ... ...
Balmford, W. ... ...
Barnard, Geo. ... ...
Barrett & Elers, Ltd. ... ...
Batteries, Ltd. ... ...
Belling & Co. ... ...
Belling & Lee, Ltd. ... ...
Benham & Sons, Ltd. xlvii
Benjamin Electric, Ltd. ...
Bennis, E., & Co., Ltd. ... ...Sup. 2
Bergmann Electric Co., Ltd. ...
Berk, F. W., & Co., Ltd. Sup. 39
Berkeley & Young, Ltd. ...
Berry, Wiggins & Co., ... Sup. 27
Berry's Electric, Ltd. xxviii
Bertram Thomas iv
Beuttell, A. W., Ltd. ... ...
Bill, S., & Co., Ltd. vii
Birkbys, Ltd. ... ...
Birmingham Mica Co. ... ...
Blackstone & Co., Ltd. ... ...
Blair, J. Martin ix
Bolton, T., & Sons, Ltd. ...
Boothroyd, H. T., Ltd.... ...
Boulton & Paul, Ltd. ... ...
Boving & Co., Ltd. ... ...
Bray, G., & Co., Ltd. ... ...
British Aluminium Co., Ltd. ...
British Electric Co. ... ...
British Electric Lamps, Ltd. ... iii
British Electric Transformer Co., Ltd. ... ... Sup. 31
British Electrical Development Association ... ...
British Engine, Boiler, and Electrical Insurance Co., Ltd.
British Hanovia Quartz Lamp Co. .. ..
British Industries Fair ... ...
British Insulated Cables, Ltd. Sup. 33
British Quain Sunlight, Ltd. ...
British Secheron Co., Ltd. ...
British Thomson-Houston Co., Ltd. ... ... Sup. 30
Britain's Elec. Motor Co. Sup. 34
Brook Motors, Ltd. ... ...
Brookhirst Switchgear, Ltd. ... xvii
Bromford Tube Co., Ltd. ...
Brownie Wireless Co. (G.B.), Ltd. viii
Browning's Electric Co. ...
Bruce Peebles & Co., Ltd. ...
Brush Elecl. Eng. Co., Ltd. ... xxi
Buck & Hickman, Ltd. ... ...
Bull Motors, Ltd. ... ...
Bullers, Ltd. xxxi
Bullock, S. E., & Co., Ltd. ...
Burdette & Co., Ltd. i
Burt, Boulton & Haywood, Ltd. xiii

Cable Makers' Association ...
Callender's Cable & Construction Co., Ltd. xiii
Cambridge Instrument Co., Ld. xliv
Canadian Porcelain Co.(British) Ltd. ... ... Sup. 29
Canning, W., & Co., Ltd. ...xxxvi
Cantie Switches, Ltd. ... ...
Carter, B. & F., & Co. ... ...
Castle, T. L. ... ...
Century Electric Co. ... ...
C.C.A. (Vacuum Cleaners), Ld.
Chamberlain & Hookham, Ld.
Chloride Elec. Storage Co., Ld. ... ...
Churchill, C., & Co., Ltd. ...
Churton, T. Harding & Co., Ld. i
City Electrical Co., Ltd. ... i
Clarke, Chapman & Co., Ltd. ...
Clayton & Shuttleworth, Ltd.... xix
Clifford (Charles) & Son, Ltd. ...
Collier, H. E. & I. ... ...
Concrete Utilities, Ltd.... ...
Connolly (Blackley), Ltd. ...
Consolidated Pneumatic Tool Co., Ltd., The ix
Contract Journal ... ...
Cox-Cavendish Electrical Co. (1924), Ltd. ... ...
Crabtree, J. A., & Co., Ltd. ...

PAGE

Crane, F., Chemical Co., Ltd. Sup. 25
Credenda Conduits Co., Ltd. ... xvii
Cressall Manufacturing Co. ... i, iii & liv
Crewe, Allen & Co. ... ...
Crockatt, W., & Sons, Ltd. ...
Crompton Parkinson, Ld. Sup. 12 & 13
Crossley Bros., Ltd. xxxv
Crypto Electrical Co., Ltd. ...
Cryselco, Ltd. ... ...Sup. 4
Curtis Manufac. Co., Ld., The... i
Cutting Bros., Ltd. i

Dacier, Ltd. ... ... Sup. 35
Davidson & Co., Ltd. ... ...Sup. 5
Davis & Timmins, Ltd. liv
Davey, Paxman & Co., Ltd. ...
Dawson, E., & Co. i
De la Rue (Thomas) & Co., Ltd. i
Dennis, W. F., & Co. ... ...
Dermatine Co., Ltd. ... ...
Dexine, Ltd. ... ...
Diamond Fibre Co., Ltd. ... viii
Dikkers, G., & Co. (England), Ltd. ix
Dixon (Leslie) & Co. ... Sup. 25
Donovan & Co. ... ...
Dorman & Smith, Ltd. ... ...
D.P. Battery Co., Ltd. ... ...
Drake & Gorham, Ltd. ... ...
Drake & Gorham Wholesale, Ltd. xxx
Drayton Regulator and Instrument Co., Ltd. (The) ... ...
Dubilier Condenser Co. (1925), Ltd. xxxiv
Duncan Watson & Co. ... ...

Earle, Bourne & Co., Ltd. ...xxxvi
Earthing Clip Co.... ... ...
Eastick, J. J., & Sons ... ...
Edison Swan Cables, Ltd. ...
Edison Swan Electric Co., Ld.
Electric and Ordnance Accessories Co., Ltd. v
Electric Control, Ld. ... xi & Sup. 3
Electric Fires, Ltd. iii
Electrical Contractors' Assoc.
Electrical Equipment & Carbon Co., Ltd. xlv
Electrical Power Engineering Co. (Birmingham), Ltd. ...xxxvi
Electrical Utilities, Ltd. ...
Electro-Mech. Brake Co., Ltd. Sup. 40
Elliott Bros. (London), Ltd. ... xlv
Ellison, George ... ...
Enfield Cable Works, Ltd. ...
Engineering & Commercial Institute ... ...
Engineering and Lighting Equipment Co., Ltd. ... ...
English Electric Co., Ltd. ...
Equipment and Eng. Co. Sup 35
Ericsson Telephones, Ltd. Sup. 36
Etching Chemical Co. ... ...
Everett Edgcumbe & Co., Ld.
Evershed & Vignoles, Ltd. ...

Fair, W. D., & Co. ... ...
Fairbanks, Morse & Co., Ltd....
Falk, Stadelmann & Co., Ltd. Sup. 11 & 41
Ferguson, Pailin, Ltd. i
Ferranti, Ltd. xxxix
Fluxite, Ltd. ... ... Sup. 34
Foamite Firefoam, Ltd. ... liii
Foster Eng. Co., Ltd. xl
Fraser & Chalmers Eng. Works
Fuerst Bros. & Co., Ltd. Sup. 36
Fuller Accumulator Co. (1926), Ltd. xx
Fuller Electrical & Mfg. Co. ...Sup. 6

Geipel, William, Ltd. ... ...
General Chemical and Pharmaceutical Co., Ltd. ... ...Sup. 4
General Electric Co., Ld. Sup. 14
Gent & Co., Ltd. lx
Gillett & Johnston ... Sup. 35
Glass House, The... ... Sup. 34
Gledhill Brook Time Recorders
Glover, W. T., & Co., Ltd. ... xxii
Gordon, Fredk. J., & Co., Ld. Sup. 25
Graton & Knight, Ltd. ... ...
Green, E., & Sons, Ltd. xlvi
Green, G., & Co. ... ...
Griffiths Bros. and Co., London, Ltd. ii

Hackbridge Electric Construction Co., Ltd. i
Hall, J. P., & Co., Ltd. ... ...
Hall, J. P., & Sons ... ...
Hann & Ingle ... ... Sup. 34
Hardtmuth, L. & C. ... Sup. 32
Hardy & Padmore, Ltd.... ...
Harris, A. E., & Co. ... ...
Harris, J. F. & G., Ltd. ... ...

PAGE

Hart Accumulator Co., Ltd. ...
Heathman, J. H. ... ...
Henley's, W. T., Telegraph Works, Ltd. ... xiv, xv & xxvii
Hewittic Electric Co., Ltd. ...
Heyes & Co., Ltd.... ... ...
Hick, Hargreaves & Co., Ltd. ...
Higgs Motors ... ...
Hightensite & Ebonite Mfg. Co., Ltd. ... ... Sup. 25
Hildick & Hildick... ... ...
Hobdell, Way & Co., Ltd. ... xlv
Hogan & Wardrop ... ...
Holder-Harriden, Ltd. ... ...
Hollings & Guest, Ltd. ... ...
Hooper's Telegraph and India-Rubber Works, Ltd. ... Sup. 30
Hornby, Robert, & Co., Ltd. ...
Horstmann Gear Co., Ltd. ...
Hotpoint Electric Appliance Co., Ltd. ... ...
Hurley Machine Co. ... Sup. 32

Igranic Electric Co., Ltd. ...
Impag, Ltd. xxxiii
Imperial Chemical Industries, Ltd. ... ...
India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.... lvi
International Electric Co. ...
Ioco Rubber and Waterproofing Co., Ltd. xxxiv
Isenthal & Co., Ltd. ... Sup. 39

Jackson Electric Stove Co. ... xx
Jenkins, W. J., & Co., Ltd. ...
Jenkins (Robert) ... ...
Johnson & Phillips, Ltd. i, Sup. 8 & 9
Johnson (Richard) & Nephew Ltd. ... ... Sup. 31
Jones (Inigo) & Co. ... ...
Joyner, C., & Co. ... ... Sup. 42

Kaye (Joseph) & Sons, Ltd. ...
Kelvin, Bottomley & Baird, Ltd.
Kent Bros. ... ...
Kent, Wm. ... ...
Key Engineering Co., Ltd. ... xlvi
Klaxon, Ltd. ... ... Sup. 41
Kohler Co., Ltd. ... ...
Korting & Mathiesen Elecl. Ltd. ... ...

Lacy-Hulbert & Co., Ltd. ...
Lake, J. L. xlvi
Lancashire Dynamo and Motor Co., Ltd. ... ...
Lawton, J., & Sons ... ...
Leach, S. G., & Co., Ltd. ... i & li
Lighting Trades, Ltd. ... ...
Litholite Insulators, Ltd. ... i
Liverpool Elec. Cable Co., Ltd. xxxviii
London Electric Firm ... ...
London Electric Wire Co., Ld. xxxviii
Low, A., & Sons, Ltd. ... ...
L.P.S. Electrical Co. xxix

Macintosh Cable Co., Ltd. ... xli
Macintyre, J., & Co., Ltd. ... xlv
Marconi Wireless Telegraph Co., Ltd. ... ... Sup. 10
Marelli & Co., Ltd. ... ...
Marryat & Place viii
Mather & Platt, Ltd. ... ...
Matterson, Ltd. ... ...
Matthews & Yates, Ltd.... ... viii
Mavor & Coulson, Ltd. i
M.A.X.E.I. ... ... Sup. 34
M.C.L. & Repetition, Ltd. ... lii
McClure & Whitfield xlv
McGeoch, W., & Co., Ltd. ... ...
McGregor & Co., R. ... ...
McKechnie Bros., Ltd. ... ...
McKenzie, Lewis, V. xlii
McMillan, J., & Co. ... ...
Medical Supply Association, Ltd. ... ... i & xxiv
Mersey Cable Works, Ltd Sup. 10
Metallic Seamless Tube Co., Ltd. ... ...
Metropolitan Electric Cable and Construction Co., Ltd. ...
Metro-Vick Supplies, Ld. Sup. 5 & 26
Metropolitan - Vickers Electrical Co., Ltd. ... ...Sup. 6
Micafil, Ltd. xxxiii
Mickelwright, Ltd. ... Sup. 35

PAGE

Midland Elec. Mfg. Co., Ld. ... i & xi
Mills, W., Ltd. ... ...
M.K. Electric Ltd. ... ...
Moores, J., & Co. liv
Mosses & Mitchell iii
Moy, Ernest, F., Ltd. i

Nalder Bros. & Thompson, Ld.
Nathan & Allen ... ... Sup. 27
Neagle, A., & Co., Ltd. ... ...
Newton Bros. (Derby), Ltd. ...
Newtons of Taunton ... ...
Nico Light Co., Ltd. ... ...
Normand Electrical Co., Ltd.... liv

Ozonair, Ltd. ... ...

Pan-Electric, Ltd. li
Park Royal Eng. Co., Ltd. ...
Parmiter, Hope & Sugden, Ld.
Parsons, C. A., & Co., Ltd. ...
Pass (Capper) & Son, Ltd. Sup. 34
Peebles (Bruce) & Co., Ltd. ...
Petters, Ltd. ... ...
Philips Lamps Ltd. ... ...
Phillips & Turner ... ...
Pickerings, Ltd. ... ...
Pirelli-General Cable Works, Ltd. xviii
Pomona Rubber Co. ... Sup. 34
Poulton, H. J. ... ... Sup. 34
Power Equipment Co. ... ...
Premier Accumulator Co. (1921), Ltd. ... ...
Premier Electric Heaters ...
Premier Gas Engine Co., Ltd.... xxxv
Pritchett & Gold & E.P.S. Co., Ltd. xxxvii
Pulsometer Eng. Co., Ltd. ... lv
Pyrene Co., Ltd., The ... Sup. 35

Quasi-Arc Co. Ltd. i

Ransomes, Sims & Jefferies, Ld. xliii
Rawlplug Co. ... ...
Reavell & Co., Ltd. ... ...
Record Elec. Co. i
Rees Roturbo Mfg. Co., Ltd. ...
Reeves & Co. ... ... Sup. 32
Revo Electric Co., Ltd.... ...Sup. 7
Reyrolle, A., & Co., Ltd. ...
Richardsons, Westgarth & Co., Ltd. ii
Richter & Pickis xliii
Robinson (Lionel) & Co.... ... i
Rock-Hard Enamel, The, Co., Ltd. ... ...
Ross Courtney & Co., Ltd. ... iii
Royce, Ltd. ... ... Sup. 34
Ruberoid Co., Ltd., The ...
Ruston & Hornsby, Ltd. ...
Ryman, F., & Co.... ... Sup. 34

Sadia, Ltd.... ... ...
Sanders, W., & Co. ... Sup. 42
Sankey, Joseph, & Sons, Ltd. ...
Sanson, Ltd. ... ...
St. Helens Cable and Rubber Co., Ltd. xxix
Sax (Julius) & Co., Ltd.... ... i
Saxonia Electrical Wire Co., Ltd. i
Scott, H. J., & Co. (Belfast), Ld.
Shaw, J., & Sons (Wolverhampton), Ltd. ... ...
Sessions & Sons, Ltd. ... ...
Siemens Electric Lamps and Supplies, Ltd. ... ... Sup. 38
Siemens Bros. & Co., Ltd. ... xxv
Silglass Co., The ... ...
Siluminite Insulator Co., Ltd.... x
Simmons & Stokes, Ltd. ... lv
Simon-Carves, Ltd. lv
Simplex Conduits, Ltd.... Sup. 43
Sisson, W., & Co., Ltd. ... ...
Sloan Electrical Co., Ltd. ...
Small Power Dynamo & Motor Co., Ltd. i
Smith (Frederick) & Co., Ltd. xxxviii
Smith, S., & Sons (M.A.), Ltd...
Snow, T. F. ... ... Sup. 34
Societe Industrielle des Telephones ... ...
Solenoid Regulator Co. ... ...
Solidite & Synthetic Mouldings, Ltd. ... ... Sup. 36
South Wales Exhibition ...
Spencer-Bonecourt, Ltd. ...
Spencers (Melksham), Ltd. ...
Spicers, Ltd. xxx
Standard Telephones & Cables, Ltd. xxvii

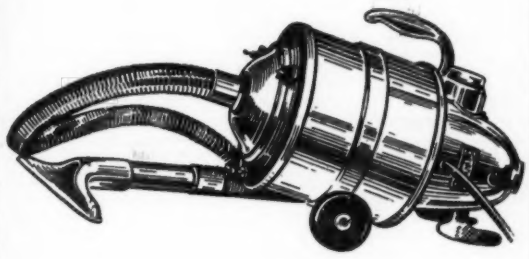
CONTINUED ON PAGE XLVI.

THE ELECTRICAL EQUIPMENT AND CARBON CO., LTD.,
107, 109 & 111, New Oxford St., London, W.C.1,

Announce that the new name of their
VACUUM CLEANER is the

'CARMENTA'

(Registered)



THE PRICE and **QUALITY**
remain the same:—
CHEAPEST and BEST.
Current Consumption: 120 Watts.
LIST PRICE:
£9 : 10 : 0
Demonstrations arranged anywhere.
"TO TRY, IS TO BUY"

First in order of Time

The First
PORCELAINS
for Electrical Work
"MADE IN ENGLAND"
were made at our Works

During the many years that have elapsed, we have made it our policy to be

First in order of Merit

also, for the quality of our Porcelain Accessories for Electrical purposes

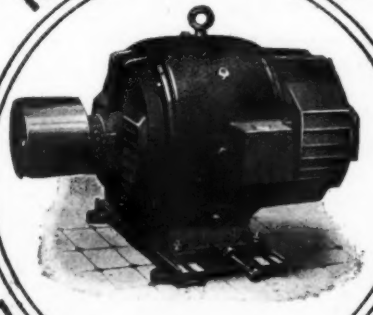
Quotations to Samples Models or Drawings

James Macintyre & Co. Ltd.
WASHINGTON WORKS
Burslem
STOKE-ON-TRENT

D.C. DYNAMOS and MOTORS.

Telephone: 2260 STOCKPORT. Telegrams: MOTORS, STOCKPORT.

MERSEY



PARATUS SUM

McCLURE & WHITFIELD, Mersey Dynamo Works, STOCKPORT.

LARGE STOCKS IN LONDON AT

CITY ELECTRICAL Co. Ltd. LONDON

EMERALD STREET, THEOBALD'S ROAD, W.C.1.
'PHONES: 5540, 5541, 5542.

Stop! CORROSION AND WATERPROOF YOUR STEELWORK AND CONCRETE BY . . .

KRODEPROOF

(AN EMULSIFIED ASPHALT).

A preventive of Corrosion and a new method of applying asphalt as a Waterproofing agent. Applied Cold by Brush or Spray to wet or dry surfaces.

KRODEPROOF Gives Perfect Protection Against WATER OR STEAM, ACID OR ALKALI FUMES, BRINE OR SMOKE, LOCOMOTIVE GASES, CORROSIVE GASES AND FUMES GENERALLY.

PARTICULARS ON REQUEST FROM:—

HOBDELL, WAY & Co., Ltd.,
45, CHURCH ST., MINORIES, LONDON, E.1.

INDEX TO ADVERTISERS.—*(Continued from page xliv.)*

	PAGE
Statter, J. G. & Co.	vi
Stella Conduit Co., Ltd.... ...	
Stella Lamp Co.	xvi
Sterling Telephone & Electric Co., Ltd.	
Sterling Varnish Co.	
Stream Line Filter Co., Ltd. ...	
Streetley Mfg. Co....	
Stuart Turner, Ltd.	xxxiii
Sturtevant Eng. Co., Ltd. ...	
Sullivan, H. W., Ltd.	
Sun Electrical Co., Ltd. ...	xii
Sutcliffe Bros. & Bryce, Ltd. ...	
Switchgear and Cowans, Ltd....	xxvi
Tarmac, Ltd.	Sup. 35
Taylor & Challen, Ltd.	
Taylor & Petters, Ltd.	ii
Taylor, Tunnicliff & Co., Ltd. ..	xliii
T.B.T. Electric Co., Ltd. ...	vii
Telegraph Condenser Co., Ltd.	
Tourtel Manufacturing Co. ...	
Trelleborg Ebonite Works, Ltd.	i
Tucker, J. H., & Co.	Sup. 1
Tudor Accumulator Co., Ltd....	
Tullis Russell & Co., Ltd. ...	
Turbine Furnace	
Turner Bros.	
Turner Bros. Asbestos Co., Ltd.	
Turner, F.	
Underwood (Mcr.), Ltd. ...	
Union Cable Co., Ltd.	
Vampires, Ltd.	
Vanderveide, L.	
Veritys, Ltd.	...Sup. 1
Venner Time Switches, Ltd. ...	
Vickers Boiler Co., Ltd. ...	
Vincent Switchgear Mfg. Co.	i & Sup. 26
Volet, René...	
Volta, Ltd.	vi
Wallwork, H., & Co., Ltd. ...	
Walsall Electrical Co., Ltd. ...	
Walsall Hardware Mfg. Co., Ld.	x
Walters (Austin) & Son, Ltd. ...	xxx
Ward & Goldstone, Ltd.	Sup. 44
Watliff Co.	Sup. 35
Watshams, Ltd.	xxiii
Webster, A., Ltd. ...	Sup. 31
Weekes (Luton), Ltd.	
Weir, G. & J., Ltd.	
Welch's Patent	
Weldrics (1922), Ltd.	
Wells, A. C., & Co., Ltd. ...	
Welsbach Light Co., Ltd.	xxxvii
West Insulating Co., Ltd.	...Sup. 4
Westinghouse Electric International Co.	
Westinghouse Morse Chain Drives	
Westminster Eng. Co., Ltd.	iii
Weston Elec. Inst. Co., Ltd.	... xxviii
Wheatley Kirk, Price & Co.	Sup. 15
White Elec. Instrument Co. ...	
White, J. C.	iii
Wiggins, F., & Sons ...	Sup. 30
Willcox, W. H., & Co., Ltd. ...	
Wolf, S. & Co., Ltd.	
Wootton & Co., Ltd.	
Wright Motors, Ltd.	
Wynn, Timmins & Co., Ltd. ...	
Yarrow & Co., Ltd.	
Yorkshire Copper Works, Ltd.	ii
Yorkshire Elec. Transformer Co., Ltd.	
Zenith Electric Co., Ltd. ...	i

AJAX LTD.

Manufacturers, Designers, Inventors & Patentees,
(SECTION E.R.), 117, CENTRAL ST., LONDON, E.C.1.
'Phone: Clerkenwell 6194. 'Grams: "Coopengear, Barb, London."

"SUNLIGHT" TREATMENT (Ultra-Violet) IRRADIATION APPARATUS.

MESSRS. AJAX, LTD., claim to be the best known firm of actual manufacturers of these apparatus with a World-wide reputation for the highest quality only, at lowest cost. 'SUNVIRAY' (Reg. Trade Mark No. 479543). Prices from £5 - 10s. (sub.). Arrangements are made to help retailers to promote sales by personally attended special demonstration weeks, advertising, etc.

GENEROUS TRADE DISCOUNTS. EXCLUSIVE DISTRICT AGENCIES GRANTED.

Free Tuition given for the manipulation and use of all apparatus.
Full particulars on application, also of complete series of all Electro-Medical Apparatus.

Branch Offices: BIRMINGHAM: 81, Edmund Street. GLASGOW: - - 5, Newton Terrace, Charing Cross. S. AFRICA: - - P.O. Box 7222, Johannesburg.

KEY FIBRE BIRD GUARDS

The KEY ENGINEERING CO., LTD.,
4, QUEEN VICTORIA STREET, LONDON, E.C. 4,
—and TRAFFORD PARK, MANCHESTER.—

Reasons

WHY YOU SHOULD BUY

S.I.T. CABLES.

1. We have been manufacturing High and Low Tension Cables for over 40 years.
2. We supply regularly to some of the largest French power and manufacturing companies.
3. Our products have a well-earned name for quality.
4. We manufacture strictly in accordance with British specifications.

Manufacturers:

S. I. T., PARIS.

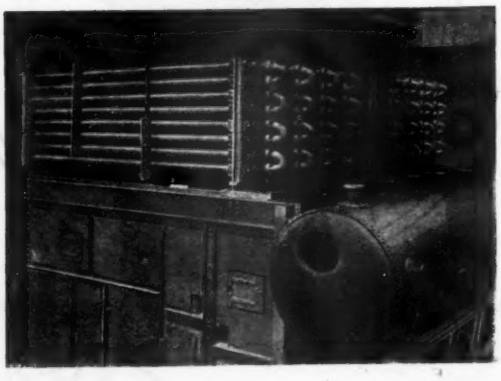
Sole Agent for British Isles:—

J. L. LAKE,
5, South St., London, E.C.2.
'Phone: Clerkenwell 5215. 'Grams: Jellenlake, Ave., London.

GREEN'S ECONOMISERS

increase the calorific value of coal used in Steam Plants

Smooth Tube and Gilled Tube designs meet every Economiser requirement



TRI-TUBE ECONOMISERS OVER A WATER-TUBE BOILER

Recommendations on receipt of details of boiler plant

E. GREEN & SON, LTD.

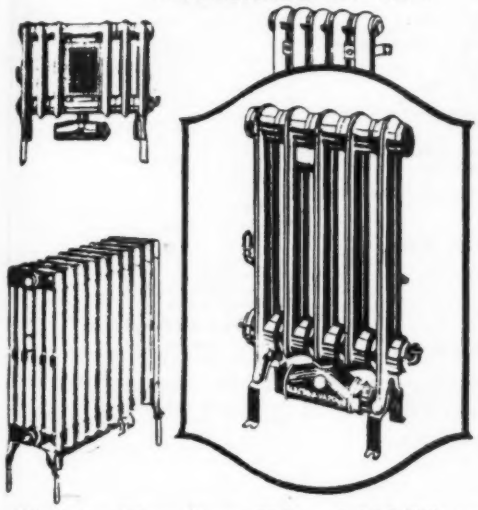
WAKEFIELD

Telegrams: "Economiser" *Telephone:* 2206

ELECTRO-VAPOUR RADIATORS

PATENT.

THOUSANDS IN USE.



For places where EVEN Temperatures are desirable.

The most economical and reliable method of Electric Domestic Heating. *Electro-Vapour* Radiators are excellently suited for heating Living and Bedrooms, Nurseries, Halls and Passages of Private Houses and Flats; also Offices, Factories, Ships' Cabins, &c., Warehouses and Garages, &c.

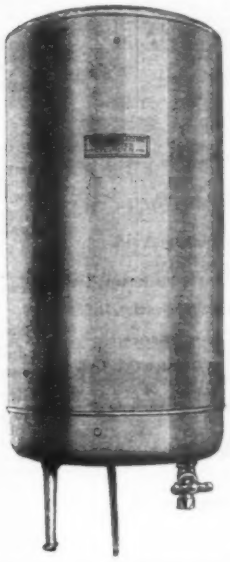
ECONOMICAL.
FIRE-PROOF.
SELF-CONTAINED.
DANGER-PROOF.
BRITISH.

Made in Sizes from 500 to 4,000 Watts and in various patterns ranging from **£6 10s. to £18**

No extra charge for 3-heat elements (3-heat switches extra.)

BENHAM'S "WIGMORE" ELECTRIC LOW-CURRENT STORAGE CYLINDER.

Lagged. Automatic in action. Simple to use. No special water-electric regulator required. Only the hottest water in the container can be drawn off. For Baths, Lavatory Basins, &c.



Sizes from 0·5 kW to 2·0 kW.

Prices on application.

Automatic Temperature Control Gears of any size or duty for regulation of **AIR (Gases, Steam). WATER Oil, Liquids).**

BENHAM & SONS, LTD., HEAD OFFICE: **64/66, Wigmore St., LONDON, W.1.**
Works: WANDSWORTH, S.W.

Telephone: Mayfair 6662 (4 lines).

ARMORDUCT CABLE COMPANY LIMITED · AC

Armorduct Wires and Cables

ESTIMATE SPECIAL NETT TRADE PRICES

THE CABLE WITH AN ESTABLISHED REPUTATION.

ARMORDUCT CABLE Co.,

—LIMITED,—

159, Westminster Bridge Road,
LONDON, S.E. 1.

A.B.C. Code—5th Edition. Telegrams—Armorduct.
Telephones—HOP 4703. WATERLOO, 1456. Lamb, London.

LEEDS:
(Yorkshire).
54, WELLINGTON STREET, LEEDS.
Telephone: No. 28129.
Telegrams: ARMORDUCT, LEEDS.

MANCHESTER:
(Lancashire, Cheshire and North Wales).
16, JOHN DALTON STREET, MANCHESTER.
Telephone No. Central 2516.

GLASGOW:
(Scotland).
38, BATH STREET, GLASGOW, C.2.
Telephone: Douglas 3321.
Telegrams: ENLIGHTEN, GLASGOW.

AND LEADING WHOLESALERS.

WRITE FOR LATEST LIST & SAMPLES.

CLASSIFIED INDEX OF ADVERTISEMENTS.

The names of Advertisers whose Announcements are ordered for a series are entered under any one Heading in this Index Free of Charge, but if repeated under existing headings **1s.** per week is charged for each additional entry.

Accessories.
Blair (J. Martin).
Fair, W. D., & Co.
Falk, Stadelmann & Co., Ltd.
Foster Engineering Co., Ltd.
General Electric Co., Ltd.
Metro-Vick Supplies, Ltd.
M.K. Electric, Ltd.
Pass, Capper & Son, Ltd.
Rawlplug Co.
Reeves & Co.
Revo Electric Co., Ltd.
Ryman, Frederick, & Co.
Santon, Ltd.
Sax, Julius & Co., Ltd.
Snow, T. F.
Simplex Conduits, Ltd.
Webster, A., Ltd.
White, J. C.

Accumulator Acid.
Berk, F. W., & Co., Ltd.
General Chemical & Pharmaceutical Co., Ltd.
Imperial Chemical Industries, Ltd.

Air Compressors.
British Thomson-Houston Co., Ltd.
Lacy-Hulbert & Co., Ltd.
Reavell & Co., Ltd.
The Consolidated Pneumatic Tool Co., Ltd.

Air Filters.
Ozonair, Ltd.

Alternators.
Brook, E., Ltd.
General Electric Co., Ltd.
Lancashire Dynamo & Motor Co., Ltd.
Parsons, C. A., & Co., Ltd.
Peebles (Bruce) & Co., Ltd.

Aluminium Castings.
Mills, W., Ltd.
Moy, Ernest F., Ltd.

Aluminium.
British Aluminium Co., Ltd.

Asphalt (Emulsified).
Hobdell, Way & Co., Ltd.

Auctioneers and Valuers (Mechanical).
Wheatley Kirk, Price & Co.

Batteries (Primary).
General Electric Co., Ltd.
India-Rubber, G. P. & T. W. Co., Ltd.

Batteries (Storage).
Batteries, Ltd.
Fuller Accumulator Co. (1926) Ltd.
Accumulator Makers' Association:—
Chloride Elect., Storage Co., Ld.
D.P. Battery Co., Ltd.
Hart Accumulator Co., Ltd.
Premier Accuml. Co. (1921), Ltd.
Pritchett & Gold & E.P.S. Co., Ltd.
Tudor Accumulator Co., Ltd.

Battery Charging Boards.
Mickelwright, Ltd.

Bells.
General Electric Co., Ltd.
Gent & Co., Ltd.
Sax, J.. & Co., Ltd.

Belting.
Dermatine Co., Ltd.
Graton & Knight, Ltd.
India-Rubber, G. P. & T. W. Co., Ltd.

Blowers (Portable Electric).
Lacy-Hulbert & Co., Ltd.
The Consolidated Pneumatic Tool Co., Ltd.

Boiler Coverings.
Sutcliffe Bros. & Bryce, Ltd.

Boilers (Watertube).
Spencer-Bonecourt, Ltd.
Vickers Boiler Co., Ltd.
Yarrow & Co., Ltd.

Books.
Contract Journal.

Boosters.
Chloride Electrical Storage Co., Ltd.

Braiding Machines.
Carter, F. & B., & Co.

Brushes.
Electrical Equipment & Carbon Co., Ltd.
Geipel, William, Ltd.

Bushes (Rubber).
Moores (John) & Co.

Cable Hangers & Racks.
McGregor & Co., R.

Cables.
(See Wire Covered.)

Cable Covers.
Barnard, G.
Concrete Utilities, Ltd.
Tarmac, Ltd.

Cable Laying Machines.
Richter & Pickis.

Carbons.
Geipel, William, Ltd.
General Electric Co., Ltd.

Casing and Capping.
Harris, J. F. & G.

Chain Drive Manufacturers.
Westinghouse Morse Chain Co., Ltd.

Circuit Breakers (Automatic).
Bertram Thomas.
British Thomson-Houston Co., Ltd.
Ellison, George.
General Electric Co., Ltd.
Statter, J. G., & Co.
Veritys Limited.

Clocks (Electric).
Gent & Co., Ltd.
Gillett & Johnston.

Coal Dust Firing.
Simon-Carves, Ltd.

Commutators.
Watliff Co.
Westminster Engineering Co., Ltd.

Concrete (Electrical).
Barnard, G.
Concrete Utilities, Ltd.
Tarmac, Ltd,

Condenser Tubes (Brass).
Earle, Bourne & Co., Ltd.
Yorkshire Copper Works, Ltd.

Condenser (Static).
British Insulated Cables, Ltd.
Telegraph Condenser Co., Ltd.

Condensers.
Dubilier Condenser Co. (1925) Ltd.

Conductors (Aluminium).
British Aluminium Co., Ltd.

Conduits.
Credenda Conduits Co., Ltd.
General Electric Co., Ltd.
Hildick & Hildick.
Key Engineering Co., Ltd.
Simmonds & Stokes, Ltd.
Simplex Conduits, Ltd.
Stella Conduit Co., Ltd.
Tarmac, Ltd.
Walsall Hardware Mfg. Co., Ltd.

Controllers.
Bertram Thomas.
British Thomson-Houston Co., Ltd.
Electric Control, Ltd.
Electro-Mechanical Brake Co., Ltd.
Ellison, George.
General Electric Co., Ltd.
Veritys, Ltd.

Convertors (Motor).
A.C.E.C. (Ateliers de Constructions Electriques de Charleroi).
Peebles (Bruce) & Co., Ltd.

Conveyors.
Fraser & Chalmers Engineering Works.
Jenkins, W. J., & Co., Ltd.

Copper and Brass Tubes (Solid Drawn).
Clifford, Chas., & Sons, Ltd.
Yorkshire Copper Works, Ltd.

Current Limiters.
Chamberlain & Hookham, Ltd.
Electrical Utilities, Ltd.
Venner Time Switches, Ltd.

Dimmers.
Cressall Manufacturing Co.
Geipel, William, Ltd.
Mickelwright, Ltd.
Moy, Ernest F., Ltd.
Walters (Austin) & Co.

Dipping Acid.
Berk, F. W., & Co., Ltd.

Distilled Water.
Berk, F. W., & Co., Ltd.

Dynamo Brushes.
British Thomson-Houston Co., Ltd.
Veritys Ltd.

Dynamo Repairs.
Bertram Thomas.

Dynamos.
British Thomson-Houston Co., Ltd.
Canning & Co., Ltd.
Crypto Electrical Co., Ltd.
Cutting Bros., Limited.
General Electric Co., Ltd.
Lancashire Dynamo & Motor Co., Ltd.
McClure & Whitfield.
Peebles (Bruce) & Co., Ltd.
Ransomes, Sims & Jefferies, Ltd.
Rees Roturbo Mfg. Co.
Royce, Ltd.
Small Power Dynamo & Motor Co. Ltd.
Veritys Ltd.

Earthing Clips.
Balmford, W.
Earthing Clip Co.
Hann & Ingle.
Phillips & Turner.
Ryman, F., & Co.

Ebonite.
Dexine, Ltd.
Hightensite & Ebonite Mfg. Co., Ltd.
India-Rubber, G.P. and T.W. Co., Ltd.
Trelleborgs Ebonite Works, Ltd.

Economisers.
Green E., & Son Ltd.

Electric Cranes.
Royce, Ltd.

Electric Drills.
The Consolidated Pneumatic Tool Co., Ltd.
Wolf, S., & Co., Ltd.

Electric Heating.
Cressall Manufacturing Co.
Edison Swan Electric Co., Ltd.
Electric Fires Ltd.
Geipel, W., Ltd.
Green, Geo., & Co.
Hotpoint Electric Appliance Co. Ltd.
Premier Electric Heaters, Ltd.
Sadia, Ltd.
Sullivan, H. W., Ltd.
Welsbach Light Co., Ltd.

Electric Washing Machines.
Duncan Watson & Co., Ltd.
Hurley Machine Co.

Electric Water Heaters.
Nathan & Allen.

Electrical Accessories.
McGeoch, W., & Co., Ltd.

Electrical Signs.
Walters (Au. tin) & Sons.

Electrical Soldering Irons.
Browning's Electric Works.

Electricity Meters.
Allen, West & Co.
Bertram Thomas
Chamberlain & Hookham, Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
Hornby (Robert) & Co., Ltd.
Korting & Mathiesen Electrical, Ltd.
Metropolitan-Vickers Elect. Co., Ltd.
Pan-Electric, Ltd.

Electrodes.
Weldrics (1922), Ltd.

Electro-Medical and X-Ray Apparatus, &c.
Ajax, Ltd.
British Hanovia Quartz Lamp Co
British Quain Sunlight, Ltd.
Cox-Cavendish Elect. Co. (1924), Ltd.
Medical Supply Assoc., Ltd.

Engineers and Contractors (Electrical).
British Thomson-Houston Co., Ltd.
Clarke, Chapman & Co., Ltd.
English Electric Co., Ltd.
India-Rubber, G. P. & T. W. Co., Ltd.
Johnson & Phillips, Ltd.
Moy, Ernest F., Ltd.
Standard Telephones & Cables, Ltd.
Veritys Ltd.
Westinghouse Elec. International Co.

Engines (Gas).
Arrol, Johnston & Aster Engineering Co., Ltd.
Premier Gas Engine Co., Ltd.

Engines (Oil).
Blackstone & Co., Ltd.
Clayton & Shuttleworth, Ltd.
Crossley Bros., Ltd.
Davey, Paxman & Co., Ltd.
Hick, Hargreaves & Co., Ltd.
Petters, Ltd.
Ruston & Hornsby, Ltd.

Engines (Steam).
Reavell & Co., Ltd.
Sisson, W., & Co., Ltd.

Exhibitions.
British Industries Fair.

Extrude Metals.
McKechnie Bros., Ltd.

Fans.
Bergmann Electric Co., Ltd.
Berkeley & Young, Ltd.
Davidson & Co., Ltd.
General Electric Co., Ltd.
Hogan & Wardrop.
Leach, S. G., & Co., Ltd.
Marelli, E., & Co., Ltd.
Metro-Vick Supplies, Ltd.
Simon-Carves, Ltd.
Veritys Ltd.

Feedwater Treatment.
Weir, G. & J., Ltd.

Fibre.
Austin & Hayes.
Dacier, Ltd.
Diamond Fibre Co., Ltd.
Mosses & Mitchell.

Fire Extinguisher.
Foamite Firefoam, Ltd.
Pyrene (The) Co., Ltd.

Fittings (Electric Light).
Benjamin Electric, Ltd.
British Thomson-Houston Co., Ltd.
Dorman & Smith, Ltd.
Drake & Gorham Wholesale, Ltd.
Engineering & Lighting Equipment Co., Ltd.
Foster Engineering Co., Ltd.
General Electric Co., Ltd.
Korting & Mathiesen Electrical Ltd.
Lawton, J., & Sons.
McGeoch, W., & Co., Ltd.
Metro-Vick Supplies, Ltd.
Simplex Conduits, Ltd.
Tucker, J. H., & Co., Ltd.
Veritys Ltd.

Forgings.
Electro Mechanical Brake Co. Ltd.
Jenkins, R.

Frosting Powder.
Etching Chemical Co.

Furnaces.
Turbine Furnace.

Fuse Boards.
Bill, S., & Co., Ltd.
Midland Electric Mfg. Co., Ltd.
Parmiter, Hope & Sugden, Ltd.
Simplex Conduits, Ltd.
Veritys Ltd.

Fuse Boxes.
Bill, S., & Co., Ltd.
Henley's, W. T., Tel. Wks. Co., Ltd.
Midland Electric Mfg. Co., Ltd.
Moy, Ernest F., Ltd.
Parmiter, Hope & Sugden, Ltd.

Fuses.
Bill, S., & Co., Ltd.
Donovan & Co.
Drake & Gorham, Ltd.
Foster Engineering Co., Ltd.
McGeoch, W., & Co., Ltd.
Midland Electric Mfg. Co., Ltd.
Moy, Ernest F., Ltd.
Parmiter, Hope & Sugden, Ltd.

Gears.
Matterson, Ltd.
Wallwork, H., & Co., Ltd.

Generators.
British Thomson-Houston Co., Ltd.
Brush Electrical Engineering Co., Ltd.
General Electric Co., Ltd.
Ransomes, Sims & Jefferies, Ltd.

Glass.
General Electric Co., Ltd.
Glass House (The).
Underwood (Manchester) Ltd.

Heating and Cooking Apparatus.
Arora Co. (The) Ltd.
Belling & Co.
Benham & Sons, Ltd.
Bertram Thomas.
Brit sh Electric Transformer Co., Ld.
Geipel, W., Ltd.
General Electric Co., Ltd.
Jackson Elec. Stove Co.
Joyner, C., & Co.
Lighting Trades, Ltd.
Low, A., & Sons.
Metro-Vick Supplies, Ltd.
Revo Electric Co., Ltd.

Heating Units.
Bray (Geo.) & Co., Ltd.

Hydrochloric Acid (Mur.-Ac.-Spir. of Salts).
Berk, F. W., & Co., Ltd.

Impregnating Plant.
M.A.X.E.I.

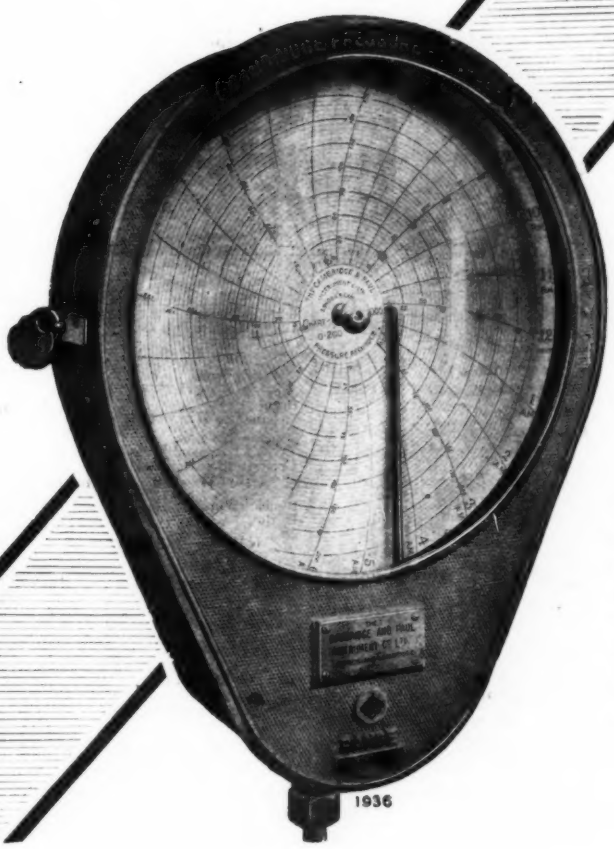
CONTINUED ON PAGE L.

ACCURATE PRESSURE RECORDING

UNDER ANY CONDITIONS

For pressures or vacua from – 15 to + 2,000 lbs. per sq. inch.

24-hour or 7-day charts 9½ inches in diameter.



Instruments of similar design can also be supplied for low pressures; ranges from 0·12 inches of water up to 0·2 lbs. per square inch.

Many hundreds of Cambridge Recorders are giving satisfactory service in all parts of the world.

May we send you a list of users and our Catalogue No. 152—X?

CAMBRIDGE PRESSURE AND VACUUM RECORDERS

for steam, liquid or gas pressures are accurate instruments designed to retain full sensitivity under the most severe conditions of service.

CAMBRIDGE

INSTRUMENT Co LTD

WORKS:- LONDON & CAMBRIDGE

Head Office & Showrooms:- 45, GROSVENOR PLACE LONDON, S.W.1.

22.

CLASSIFIED INDEX OF ADVERTISEMENTS.—*(Continued from page xlviii).*

India-Rubber.
India-Rubber, G. P. & T. W. Co., Ltd.

Instruments (Measuring).
Bailey, Sir W. H., & Co., Ltd.
British Thomson-Houston Co., Ltd.
Cambridge Instrument Co., Ltd.
Crockatt W., & Sons, Ltd.
Dixon (Leslie) & Co.
Elliott Bros. (London), Ltd.
Everett, Edgcumbe & Co., Ltd.
Evershed & Vignoles, Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
India-Rubber, G. P. & T. W. Co., Ltd.
International Electric Co.
Johnson & Phillips, Ltd.
Kelvin, Bottomley & Baird, Ltd.
Metropolitan-Vickers Elec. Co.
Nalder Bros. & Thompson, Ltd.
Record Electrical Co., Ltd.
Siemens Bros. & Co., Ltd.
Walsall Electrical Co., Ltd.
Weston Elec. Instrument Co., Ltd.
White Electrical Instrument Co.

Insulating Beads.
Dacier, Ltd.
Holder-Harriden, Ltd.
Robinson (Lionel) & Co.
Taylor, Tunnicliff & Co., Ltd.

Insulating Material.
Barrett & Elers, Ltd.
Berry, Wiggins & Co., Ltd.
Birkbys, Ltd.
Canadian Porcelain Co. (British), Ltd.
Dacier, Ltd.
De La Rue (Thomas) & Co., Ltd.
Ellison, George.
General Electric Co., Ltd.
Griffiths Bros. & Co. (London), Ltd.
India-Rubber, G. P. & T. W. Co., Ltd.
Ioco Rubber and Waterproofing Co., Ltd.
Litholite Insulators, Ltd.
L.P.S. Electrical Co.
Micafil Ltd.
Neagle, A., & Co., Ltd.
Pomona Rubber Co.
Ruberoid Co., Ltd.
Siluminite Insulators Co., Ltd.
Spicers, Ltd.
Taylor & Petters, Ltd.
Tullis Russell & Co., Ltd.
Turner Bros. Asbestos Co., Ltd.
West Insulating Co., Ltd.

Insulators.
Bullers, Ltd.
Canadian Porcelain Co. (British), Ltd.
Elec. & Ordnance Accessories Co., Ld.
Taylor, Tunnicliff & Co., Ltd.

Insurance.
British Engine, Boiler and Electrical Insurance Co., Ltd.

Ironclad Switchgear.
Berry's Electric, Ltd.
Bill, S., & Co., Ltd.
British Thomson-Houston Co., Ltd.
Cantie Switches, Ltd.
Ellison, George.
Ferguson, Pailin, Ltd.
Foster Engineering Co., Ltd.
General Electric Co., Ltd.
Metropolitan-Vickers Elec, Co., Ltd.
Midland Electric Manufacturing Co.
Parmiter, Hope & Sugden, Ltd.
Reyrolle, A., & Co., Ltd.
Sanders, W., & Co.
Simplex Conduits, Ltd.
Statter, J. G., & Co.
Vincent Switchgear Mfg. Co.

Jacks (Lifting).
The Consolidated Pneumatic Tool Co. Ltd.

Joint Box Compounds.
Berry, Wiggins & Co., Ltd.

Joint Boxes.
Tarmac, Ltd.

Ladders.
Heathman, J. H.

Lamp Holders.
General Electric Co., Ltd.
Standard Telephones & Cables, Ltd.

Lamp Shades.
Silglass Co., Ltd.

Lamps (Arc).
General Electric Co., Ltd.

Lamps (Carbon and M.F.)
British Elec. Lamps, Ltd.
British Thomson-Houston Co., Ltd.
Cryselco, Ltd.
Dawson, E., & Co.
Drake & Gorham Wholesale, Ltd.
Foster Engineering Co., Ltd.
General Electric Co., Ltd.
Metro-Vick Supplies, Ltd.
Philips Lamps, Ltd.
Siemens & English Electric Lamp Co., Ltd.
Sloan Electrical Co., Ltd.
Stella Lamp Co.

Lamps (Portable).
Heyes & Co., Ltd.
Smith, S., & Sons (M.A.), Ltd.

Lathes.
Churchill, C., & Co., Ltd.

Lift Makers.
Pickerings, Ltd.

Lighting Sets.
Boulton & Paul, Ltd.
City Electrical Co.
Fairbanks, Morse & Co., Ltd.
General Electric Co., Ltd.
Kohler Co., Ltd.
Stuart Turner, Ltd.

Machine Tools.
Taylor & Challen, Ltd.

Metal-Porcelain Cement.
Fuerst Bros. & Co., Ltd.

Mica.
Birmingham Mica Co.
Dacier, Ltd.
Taylor & Petters, Ltd.
Vandervelde, L.
Wiggins, F., & Sons

Motor Starters & Controllers.
Airedale Electrical Mfg. Co., Ltd.
Bertram Thomas.
British Thomson-Houston Co., Ltd.
Brookhirst Switchgear, Ltd.
Electro-Mechanical Brake Co., Ltd.
Ellison, George.
Geipel, Wm., Ltd.
General Electric Co., Ltd.
Igranic Electric Co., Ltd.
Metropolitan-Vickers Elec. Co., Ltd.
Moy, Ernest F., Ltd.
Solenoid Regulator Co.
Veritys, Ltd.

Motors.
British Thomson-Houston Co., Ltd.
Brittain's Electric Motor Co.
Brook Motors, Ltd.
Bull Motors, Ltd.
Century Electric Co.
Churton, T. Harding, & Co., Ltd.
Crompton-Parkinson, Ltd.
Crypto Electrical Co., Ltd.
Cutting Bros. & Co., Ltd.
Dikkers, G., & Co. (England), Ltd.
Electrical Power Engineering Co. (Birmingham), Ltd.
Fair, W. D., & Co., Ltd.
General Electric Co., Ltd.
Hall, J. P., & Co., Ltd.
Higgs Motors.
Hogan & Wardrop.
Lancashire Dynamo & Motor Co., Ld.
Leach, S. G., & Co., Ltd.
Mather & Platt.
Mavor & Coulson, Ltd.
McClure & Whitfield.
McKenzie (Lewis), V.
Metropolitan-Vickers Elecl. Co., Ltd.
Newton Bros. (Derby), Ltd.
Newtons of Taunton.
Normand (The) Electrical Co., Ltd.
Pan-Electric, Ltd.
Peebles (Bruce) & Co., Ltd.
Ransomes, Sims & Jefferies, Ltd.
Rees Roturbo Mfg. Co., Ltd.
Royce, Ltd.
Scott, H. J., & Co. (Belfast), Ltd.
Small Power Dynamo & Motor Co., Ltd.
Sun Electrical Co., Ltd.
T.B.T. Elec. Co., Ltd.
Veritys Ltd
Wright Motors, Ltd.

Motor Repairs.
Brownings Electric Co.
Crewe, Allen & Co.
White, Jacoby & Co., Ltd.

Moulding Material.
Bakelite, Ltd.
Rock Hard Enamel (The), Co.

Moulded Pressings.
Ashdown, H. E. (B'ham.), Ltd.
Ellmar Mouldings Co.
Solidite & Synthetic Mouldings, Ltd.
Streetley Mfg. Co.

Nitric Acid.
Berk, F. W., & Co., Ltd.

Oil.
Willcox, W. H., & Co., Ltd.

Oil Cans and Filters.
Wells, A. C., & Co.

Oil Feeders.
Kaye (Joseph) & Sons, Ltd.

Oil Purifiers.
Alfa-Laval Co., Ltd.
Stream Line Filter Co., Ltd.

Overhead Transmission.
Watshams, Ltd.

Ozone.
Ozonair Ltd.

Padlocks.
Tourtel Mfg. Co.

Phosphor Bronze Sheets, &c.
Clifford, Chas., & Son, Ltd.

Pillars.
Hardy & Padmore, Ltd.

Porcelain, China, &c.
Canadian Porcelain Co. (British) Ld.
Kent, Wm.
Leach, S. G., & Co., Ltd.
Macintyre, J., & Co., Ltd.
Taylor, Tunnicliff & Co., Ltd.

Power Presses.
Ross, Courtney & Co., Ltd.

Presses.
Taylor & Challen.

Pulverised Coal Plant.
Simon-Carves, Ltd.

Pumps.
Hall, J. P., & Sons.
Lacy-Hulbert & Co., Ltd.
Pulsometer Engineering Co.
Rees Roturbo Mfg. Co., Ltd.

Recording Apparatus.
Gent & Co.

Rectifiers.
Hewittic Electric Co., Ltd.
Pan-Electric, Ltd.

Reflectors.
Benttell, A. W., Ltd.
Nico Light Co., Ltd.

Regulators.
Cressall Manufacturing Co.

Resistances.
Cressall Manufacturing Co.
Curtis Manufacturing Co., Ltd.
Electro-Mechanical Brake Co., Ltd.
Micklewright Ltd.
Moy, Ernest F., Ltd.
Walters (Austin) & Son.

Resistance Wire.
Cressall Manufacturing Co.
Gordon, Fredk. J., & Co., Ltd.
Robinson (Lionel) & Co.

Rewinds.
British Electric Co.
Burdette & Co., Ltd.

Rheostats.
Bertram Thomas.
British Thomson-Houston Co., Ltd.
Cressall Manufacturing Co.
Geipel, William, Ltd.
Isenthal & Co., Ltd.
Moy, Ernest F., Ltd.
Walters (Austin) & Son, Ltd.
Zenith Electric Co., Ltd.

Screws and Terminals.
Armstrong, Stevens & Son.
B. A. Mfg. Co., Ltd.
Belling-Lee.
Davis & Timmins, Ltd.
Eastick, J. J., & Sons.
L.P.S. Electrical Co.
M.C.L. & Repetition, Ltd.
Ross, Courtney & Co., Ltd.

Searchlights.
London Elec. Firm.

Signals (Industrial).
Gent & Co.
Klaxon, Ltd.

Slate.
Ashford, Dunn & Co., Ltd.
Bullock, S. E., & Co., Ltd.
Inigo Jones & Co.
Sessions & Sons, Ltd.

Slotted Steel.
Welch's Patents.

Soldering Material.
Fluxite, Ltd.

Stampings.
Harris, A. E., & Co., Ltd.
Sankey, J., & Sons, Ltd.
Turner Bros.

Steel Magnets.
Dennis, W. F., & Co.

Stokers.
Bennis, E., & Co., Ltd.

Sulphuric Acid.
Berk, F. W., & Co., Ltd.

Switchboards.
Berry's Electric, Ltd.
Bertram Thomas.
British Thomson-Houston Co., Ltd.
Ellison, George.
Ferguson, Pailin, Ltd.
Foster Engineering Co., Ltd.
General Electric Co., Ltd.
Johnson & Phillips, Ltd.
Mavor & Coulson, Ltd.
Moy, Ernest F., Ltd.
Park Royal Engineering Works.

Switchboards.—*continued.*
Power Equipment Co., Ltd.
Statter, J. G., & Co.
Switchgear & Cowans, Ltd.
Veritys Ltd.
Walsall Electrical Co., Ltd.

Switches.
Berry's Electric, Ltd.
Bertram Thomas.
Bill, S., & Co., Ltd.
British Thomson-Houston Co., Ltd.
Crabtree, J. A., & Co., Ltd.
Dorman & Smith, Ltd.
Drayton Regulator and Instrument Co., Ltd.
Ferguson, Pailin, Ltd.
Foster Engineering Co., Ltd.
General Electric Co., Ltd.
Johnson & Phillips, Ltd.
McGeoch, W., & Co., Ltd.
Metropolitan-Vickers Elec. Co., Ltd.
Midland Electric Mfg. Co., Ltd.
Moy, Ernest F., Ltd.
Reyrolle, A., & Co., Ltd.
Simplex Conduits, Ltd.
Tucker, J. H., & Co.
Veritys, Ltd.
Weekes, L. (Luton), Ltd.

Surrounds (Art Metal).
Turner, F.

Tapes.
Connolly (Blackley), Ltd.
Dacier, Ltd.
Geipel, William, Ltd.
L.P.S. Electrical Co.

Telegraph Poles.
Armstrong, Addison & Co.
Burt, Boulton & Heywood, Ltd.

Telephones.
Automatic Telephone Mfg. Co., Ltd.
Ericsson Telephones, Ltd.
General Electric Co., Ltd.
Gent & Co., Ltd.
Standard Telephones & Cables, Ltd.
Sterling Telephone & Electric Co. Ltd.

Temperature Regulators.
Nathan & Allen.

Time Recorders.
Gledhill Brook Time Recorders.

Time Switches.
Geipel, Wm., & Co.
Gent & Co., Ltd.
Horstmann Gear Co., Ltd.
Nathan & Allen.
Venner Time Switches, Ltd.

Tipplers.
Spencers (Melksham), Ltd.

Tools, &c.
Buck & Hickman.
Castle, T. L.
Volet, René.
Wynn, Timmins & Co., Ltd.

Tools (Portable Electric).
Marryat & Place.
The Consolidated Pneumatic Tool Co., Ltd.

Tramway Supplies.
British Thomson-Houston Co., Ltd.
General Electric Co., Ltd.
McGeoch, W., & Co., Ltd.

Transformers.
British Electric Transformer Co.
British Thomson-Houston Co., Ltd.
Dikkers, G., & Co. (England), Ltd.
Ferranti, Ltd.
Foster Engineering Co., Ltd.
Fuller Electrical & Mfg. Co.
General Electric Co., Ltd.
Hackbridge Electric Construction Co., Ltd.
Johnson & Phillips, Ltd.
Metropolitan-Vickers Elec. Co., Ltd.
Peebles (Bruce) & Co., Ltd.
Statter, J. G., & Co.
Yorkshire Elec. Transformer Co., Ld.

Tubes (Solid Drawn), Copper, Brass and Condenser.
Bromford Tube Co., Ltd.
Metallic Seamless Tube Co., Ltd.
Yorkshire Copper Works, Ltd.

Tubular Sleeving.
Dacier, Ltd.
L.P.S. Electrical Co.

Turbines.
Fraser & Chalmers Eng. Works.

Turbines (Steam).
British Thomson-Houston Co., Ltd.
Richardsons, Westgarth & Co., Ltd.

Turbines (Water).
Boving & Co., Ltd.

Vacuum Cleaners.
C.C.A. (Vacuum Cleaners), Ltd.
Duncan Watson & Co.
Shaw, J., & Sons (W'hampton), Ltd.
Sturtevant Eng. Co., Ltd.
Vampires, Ltd.
Volta, Ltd.

CONTINUED ON PAGE LII.

GANZ
A.C. METERS

TOTAL COIL LOSSES UNDER 1 WATT.

NO CREEPING.

TEMPORARY OVERLOAD 200 PER CENT.

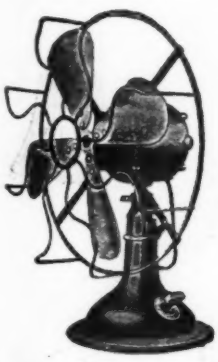
LOWEST PRICES.

SIMPLE MAINTENANCE.

LONDON STOCKS.

PAN-ELECTRIC, LTD.,

Telephone: City 6277. 72-78, FLEET STREET, E.C.4.



FANS

GLEACH & CO. LTD.

DESK & BRACKET
EXHAUST
CEILING
CABIN & RAILWAY

For all Voltages, Periodicities & Climates.

Large Stocks always available.

26-30, ARTILLERY LANE, LONDON, E. 1.
Phone: 3640 London Wall (4 lines). Grams: "Admil, Ald, London."
Branches in all principal towns.

CLASSIFIED INDEX OF ADVERTISEMENTS.– *(Continued from page l.)*

Vacuum Pumps.
Lacy-Hulbert & Co., Ltd.
The Consolidated Pneumatic Tool Co., Ltd.

Varnishes, &c.
Crane, Fredk., Chemical Co., Ltd.
Sterling Varnish Co.

Ventilation.
General Electric Co., Ltd.
Matthews & Yates, Ltd.
Veritys Ltd.

Water Recorders.
Gent & Co., Ltd.

Water-power Engineers.
Boving & Co., Ltd.

Welding Machines (Electric).
British Secheron Co., Ltd.
Equipment & Engineering Co.
"M.P." Elec. Welding Machine Co.
Quasi-Arc Co., Ltd.

Wire (Covered).
Armorduct Cable Co.
British Insulated Cables, Ltd.
Cable Makers' Association.
Callender's Cable & Construction Co.
Collier, H. E. & I.
Connolly (Blackley), Ltd.
Enfield Cable Works, Ltd.
Foster Engineering Co., Ltd.
Geipel, Wm., Ltd.
General Electric Co., Ltd.
Glover, W. T., & Co., Ltd.
Henley's, W. T., Teleg. Works Co., Ltd.

Wire (Covered).—*continued.*
Hooper's Telegraph & I.R. Works, Ltd.
India-Rubber, G. P. & T.W. Co., Ltd.
Johnson & Phillips, Ltd.
Kent Bros.
Lake, J. L.
Liverpool Electric Cable Co., Ltd.
London Electric Wire Co., Ltd.
L.P.S. Electrical Co.
Macintosh Cable Co., Ltd.
McGeoch, W., and Co., Ltd.
McMillan, J., & Co.
Mersey Cable Works, Ltd.
Metropolitan Electric Cable and Construction Co., Ltd.
Saxonia Electrical Wire Co., Ltd.
Siemens Bros. & Co., Ltd.
St. Helens Cable & Rubber Co., Ltd.
Standard Telephones & Cables, Ltd.
Union Cable Co., Ltd.
Ward & Goldstone, Ltd.

Wire (Uncovered).
Bolton, T., & Sons, Ltd.
Richard, Johnson & Nephew, Ltd.
Smith, F., & Co., Ltd.

Wireless.
General Electric Co., Ltd.
Gent & Co.
Marconi Wireless Telegraph Co.
Sloan Electrical Co., Ltd.
Ward & Goldstone, Ltd.

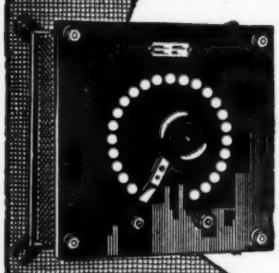
Wiring Systems.
Simplex Conduits, Ltd.

Woodwork (Electrical).
Wootton & Co., Ltd.

MISCELLANEOUS ANNOUNCEMENTS,

Relating to Situations, Articles for Sale and Wanted, &c., appear on Sup. 15, &c.

SHUNT REGULATORS



KEENEST PRICES,
SOUNDLY BUILT
BRITISH MADE.

Send us your detailed requirements and we will let you have our rock-bottom prices. Many standard types actually in stock for immediate delivery. : : : : :

CRESSALL Mfg. Co.,
31, Tower Street, BIRMINGHAM
'Phone: CENTRAL 3468.
'Grams: Ohmic, B'ham.

SCREW MACHINE PRODUCT of EXCELLENCE

TELEGRAMS: KARLYTE KO, LANGLEY WORKS
M.C.L. & REPETITION, LTD.
POOL LANE, LANGLEY
BIRMINGHAM
TELEPHONE: SMETHWICK 1112

C.T.S. has come to STAY!

FOR wiring generally, and house wiring in particular, "C.T.S." Cabling is certainly gaining in popularity. Conductors are so remote from earth potential that "infinity" tests are the rule. Ease in handling is further simplified by the

T.R.S. CONNECTOR BOX

which "C.T.S.," "T.R.S." and "Maconite" enthusiasts acclaim essential to quick and quality work. For there's no time-taking and patience-trying loose connectors or manœuvring of conductors. Every joint is wired in its fixed place with room to spare. The base and cover are non-hygroscopic and fire-proof, and of universal application from one to four ways without cutting or the leaving of open apertures. And—but write for "T.R.S." List for fuller details.

EMILY ADA WHITE, Executrix of **J. C. WHITE,**
Specialists in Shock and Corrosion-proof Lighting Accessories
49, Bridge Street, MANCHESTER.
Telephone: Central 1090 and 1091.
Telegrams "Voltaic," Manchester.
GLASGOW: 74, York Street, C.1.
Telephone: Central 6393.
POTTERIES: Fountain Place Bldgs., Liverpool Rd., Burslem.

"FINIS CORONAT OPUS"

BELL MAXTRIPS HAVE STOOD

THE TEST OF TIME.

THEY ARE MORE POPULAR TO-DAY THAN THEY HAVE EVER BEEN SINCE THEY WERE FIRST INTRODUCED, BECAUSE OF THEIR

DURABILITY and BRILLIANCE.
LONG LIFE and EXTRA LIGHT.
MOREOVER THEY GIVE AN EQUALLY
EXCELLENT PERFORMANCE
IN ANY POSITION on A.C. or D.C. Circuits.

Advert. of
BRITISH ELECTRIC LAMPS LTD.,
WIMBLEDON, S.W.19.

For cars, motor boats and electrical risks

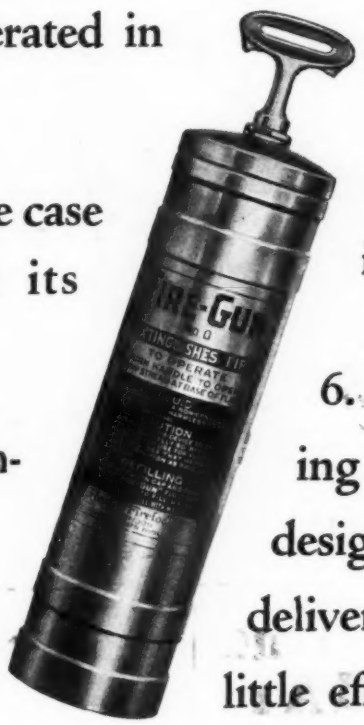
An improved C.T.C. Extinguisher.

1. It can be operated in any position.

2. Denting of the case does not affect its efficiency.

3. Leaking is eliminated.

4. The nozzle is protected.



5. No solder, which tends to cause corrosion, is used internally.

6. The double-acting pump is of special design to ensure quick delivery of fluid with little effort.

The "Fire-Gun" is designed for the combating of those fires which are so likely to occur on cars and motor boats or around electrical equipment. The special liquid used is a non-conductor of electricity.

If you have not yet seen the "Fire-Gun," one will be sent free for inspection and test. Should the appliance not be retained, the cost of the return carriage will be sent upon application

The "Fire-Gun" is approved by the Fire Offices' Committee, the Board of Trade and the Metropolitan Police

Foamite Firefoam, Limited, 55-57, Gt. Marlborough St., London, W.1.

Foamite Fire Protection

A Complete Engineering Service

Against Fire

DAVIS & TIMMINS

— Screw Manufacturers — (LTD.),

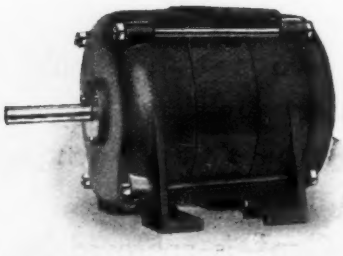
YORK ROAD, KING'S CROSS, and WOOD GREEN, LONDON, N.

Telephone: NORTH 0580. Telegraphic Address: "CONDUCTIVITY, LONDON."

STANDARD CABLE ENDS.

Machined both sides of bolt hole, thereby ensuring good contact.

REPULSION-INDUCTION MOTORS.



Interchangeable with D.C. or Squirrel-Cage.
Starts against Twice Full Load.
Starts with plain Line Switch.
Drip-Proof Enclosure.
Self-Aligning Ball Bearings.
Fan Ventilation.
British-Built Throughout.

¼ H.P., 1,400 r.p.m. .... **£6 : 15 : 0**

½ H.P., 1,400 r.p.m. .... **£8 : 10 : 0**

THE NORMAND ELECTRICAL CO., LTD.,
3, North Side, Clapham Common, London, S.W.4.

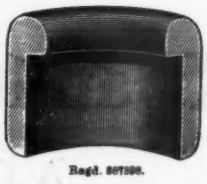
NECO

CRESSALL RESISTANCE NETS

Cressall non-inductive Asbestos-woven Resistance Nets are pre-eminently suitable for STARTERS, CONTROLLERS, REGULATORS, ACCUMULATOR CHARGING, LAMP DIMMING, METER TESTING, ELECTRO-MEDICAL APPARATUS, OIL-IMMERSED RESISTANCES, and HEATING RESISTANCE WORK of every description. Write NOW for new illustrated List containing revised prices and useful data.
THE CRESSALL MFG. CO.
31-32, Tower St.
Birmingham.

"MEGOHMIOR" RUBBER BUSHES

½"	@ 7/9	gross
⅝"	@ 8/3	„
¾	@ 10/6	„
1"	@ 16/6	„
1¼"	@ 31/-	„
1½"	@ 39/-	„
2"	@ 47-	„



Net Trade Prices.

NOTE THESE NEW PRICES FROM 1st JUNE.

Manufactured by—

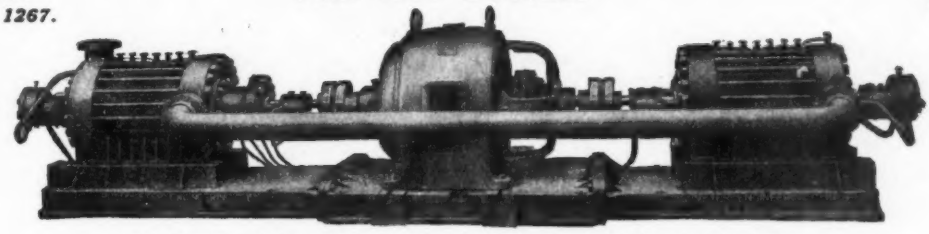
JOHN MOORES & CO.,
Orbit Works, Ravald St., SALFORD, Lancs.

CENTRIFUGAL & TURBINE PUMPS

FOR ALL DUTIES.

WRITE FOR LIST No. 1267.

The 'Turbine' Symbol.



16-Cell Double-unit Set. 20,000 G.P.H., 1,545 ft. head, 1,460 R.P.M., 300 B.H.P Motor.

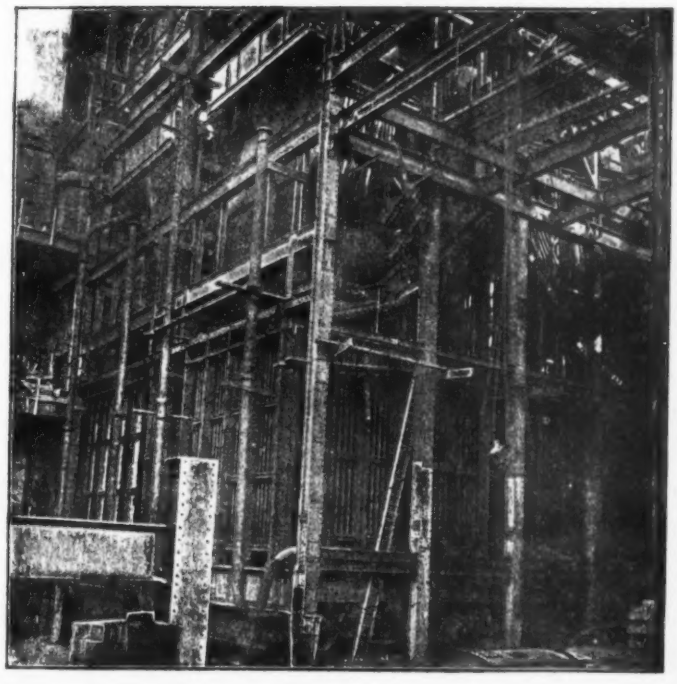
11, Tothill Street, LONDON, S.W.1. **Pulsometer Engineering Co. Ltd** Nine Elms Ironworks, READING.

SIMON-CARVES LTD.

20, MOUNT STREET, MANCHESTER.

BOILERS SPECIALLY DESIGNED FOR PULVERISED FUEL.

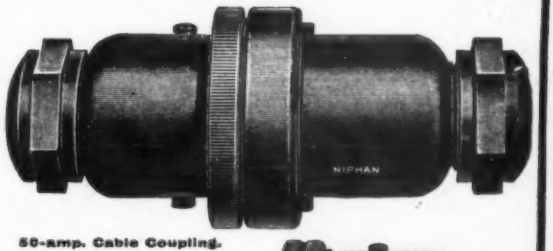
View of two of the four SIMON-CARVES Boilers during erection at the Princes Station, Nechells, of the Birmingham Corporation Electricity Dept.



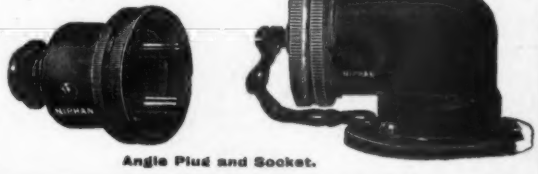
PULVERISED FUEL PLANT OF EVERY DESCRIPTION ON BOTH THE CENTRAL AND UNIT SYSTEMS.

Registered "NIPHAN" Trade Mark

WATERTIGHT PLUGS AND CABLE COUPLINGS.



50-amp. Cable Coupling.



Angle Plug and Socket.

SIMMONDS & STOKES, Ltd.,

(Successors to SIMMONDS BROS., Ltd.),

4, Vernon Place, Southampton Row, W.C. 1.

Telephone: Museum 8637.

Telegrams: "Niphen," Westcent, London.

Specify "Silvertown" V.I.R Cables and Wires & Ensure Satisfaction

C.M.A.

Registered Trade Mark.
Nos. 122,219-20-21.

Copyright
L. B. Atkinson
Exclusive Licensees
Members of the C.M.A.

THE INDIA RUBBER, GUTTA PERCHA & TELEGRAPH WORKS Co., Ltd.

(The Silvertown Company).

Head Office :
106, Cannon Street, London, E.C. 4.

Works :
Silvertown, London, E.16 and Burton-on-Trent.

BRANCHES :

Home : Belfast · Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, London, Manchester, Newcastle-on-Tyne, Portsmouth, Sheffield.
Abroad : Buenos Ayres, Calcutta · Cape Town, Christchurch (N.Z.), Durban, Johannesburg, Melbourne.

Printed by THE PREMIER LINOTYPING AND PRINTING CO., LTD., 21-25, Dean Street, Fetter Lane, E.C.4, and Published by THE ELECTRICAL REVIEW, LTD., 4, Ludgate Hill, London, E.C.4.